

Table B.6A  
F Distribution .75 Quantiles

| $\nu_2$<br>(Denominator<br>Degrees of<br>Freedom) | $\nu_1$ (Numerator Degrees of Freedom) |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |          |  |
|---------------------------------------------------|----------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----------|--|
|                                                   | 1                                      | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 12   | 15   | 20   | 24   | 30   | 40   | 60   | 120  | $\infty$ |  |
| 1                                                 | 5.83                                   | 7.50 | 8.20 | 8.58 | 8.82 | 8.98 | 9.10 | 9.19 | 9.26 | 9.32 | 9.41 | 9.49 | 9.58 | 9.63 | 9.67 | 9.71 | 9.76 | 9.80 | 9.85     |  |
| 2                                                 | 2.57                                   | 3.00 | 3.15 | 3.23 | 3.28 | 3.31 | 3.34 | 3.35 | 3.37 | 3.38 | 3.39 | 3.41 | 3.43 | 3.43 | 3.44 | 3.45 | 3.46 | 3.47 | 3.48     |  |
| 3                                                 | 2.02                                   | 2.28 | 2.36 | 2.39 | 2.41 | 2.42 | 2.43 | 2.44 | 2.44 | 2.44 | 2.45 | 2.46 | 2.46 | 2.46 | 2.47 | 2.47 | 2.47 | 2.47 | 2.47     |  |
| 4                                                 | 1.81                                   | 2.00 | 2.05 | 2.06 | 2.07 | 2.08 | 2.08 | 2.08 | 2.08 | 2.08 | 2.08 | 2.08 | 2.08 | 2.08 | 2.08 | 2.08 | 2.08 | 2.08 | 2.08     |  |
| 5                                                 | 1.69                                   | 1.85 | 1.88 | 1.89 | 1.89 | 1.89 | 1.89 | 1.89 | 1.89 | 1.89 | 1.89 | 1.89 | 1.88 | 1.88 | 1.88 | 1.88 | 1.87 | 1.87 | 1.87     |  |
| 6                                                 | 1.62                                   | 1.76 | 1.78 | 1.79 | 1.79 | 1.78 | 1.78 | 1.78 | 1.77 | 1.77 | 1.77 | 1.76 | 1.76 | 1.75 | 1.75 | 1.75 | 1.74 | 1.74 | 1.74     |  |
| 7                                                 | 1.57                                   | 1.70 | 1.72 | 1.72 | 1.71 | 1.71 | 1.70 | 1.70 | 1.69 | 1.69 | 1.68 | 1.68 | 1.67 | 1.67 | 1.66 | 1.66 | 1.65 | 1.65 | 1.65     |  |
| 8                                                 | 1.54                                   | 1.66 | 1.67 | 1.66 | 1.66 | 1.65 | 1.64 | 1.64 | 1.64 | 1.63 | 1.62 | 1.62 | 1.61 | 1.60 | 1.60 | 1.59 | 1.59 | 1.58 | 1.58     |  |
| 9                                                 | 1.51                                   | 1.62 | 1.63 | 1.63 | 1.62 | 1.61 | 1.60 | 1.60 | 1.59 | 1.59 | 1.58 | 1.57 | 1.56 | 1.56 | 1.55 | 1.54 | 1.54 | 1.53 | 1.53     |  |
| 10                                                | 1.49                                   | 1.60 | 1.60 | 1.59 | 1.59 | 1.58 | 1.57 | 1.56 | 1.56 | 1.55 | 1.54 | 1.53 | 1.52 | 1.52 | 1.51 | 1.51 | 1.50 | 1.49 | 1.48     |  |
| 11                                                | 1.47                                   | 1.58 | 1.58 | 1.57 | 1.56 | 1.55 | 1.54 | 1.53 | 1.53 | 1.52 | 1.51 | 1.50 | 1.49 | 1.49 | 1.48 | 1.47 | 1.47 | 1.46 | 1.45     |  |
| 12                                                | 1.46                                   | 1.56 | 1.56 | 1.55 | 1.54 | 1.53 | 1.52 | 1.51 | 1.51 | 1.50 | 1.49 | 1.48 | 1.47 | 1.46 | 1.45 | 1.45 | 1.44 | 1.43 | 1.42     |  |
| 13                                                | 1.45                                   | 1.55 | 1.55 | 1.53 | 1.52 | 1.51 | 1.50 | 1.49 | 1.49 | 1.48 | 1.47 | 1.46 | 1.45 | 1.44 | 1.43 | 1.42 | 1.42 | 1.41 | 1.40     |  |
| 14                                                | 1.44                                   | 1.53 | 1.53 | 1.52 | 1.51 | 1.50 | 1.49 | 1.48 | 1.47 | 1.46 | 1.45 | 1.44 | 1.43 | 1.42 | 1.41 | 1.41 | 1.40 | 1.39 | 1.38     |  |
| 15                                                | 1.43                                   | 1.52 | 1.52 | 1.51 | 1.49 | 1.48 | 1.47 | 1.46 | 1.46 | 1.45 | 1.44 | 1.43 | 1.41 | 1.41 | 1.40 | 1.39 | 1.38 | 1.37 | 1.36     |  |
| 16                                                | 1.42                                   | 1.51 | 1.51 | 1.50 | 1.48 | 1.47 | 1.46 | 1.45 | 1.44 | 1.44 | 1.43 | 1.41 | 1.40 | 1.39 | 1.38 | 1.37 | 1.36 | 1.35 | 1.34     |  |
| 17                                                | 1.42                                   | 1.51 | 1.50 | 1.49 | 1.47 | 1.46 | 1.45 | 1.44 | 1.43 | 1.43 | 1.41 | 1.40 | 1.39 | 1.38 | 1.37 | 1.36 | 1.35 | 1.34 | 1.33     |  |
| 18                                                | 1.41                                   | 1.50 | 1.49 | 1.48 | 1.46 | 1.45 | 1.44 | 1.43 | 1.42 | 1.42 | 1.40 | 1.39 | 1.38 | 1.37 | 1.36 | 1.35 | 1.34 | 1.33 | 1.32     |  |
| 19                                                | 1.41                                   | 1.49 | 1.49 | 1.47 | 1.46 | 1.44 | 1.43 | 1.42 | 1.41 | 1.41 | 1.40 | 1.38 | 1.37 | 1.36 | 1.35 | 1.34 | 1.33 | 1.32 | 1.30     |  |
| 20                                                | 1.40                                   | 1.49 | 1.48 | 1.47 | 1.45 | 1.44 | 1.43 | 1.42 | 1.41 | 1.40 | 1.39 | 1.37 | 1.36 | 1.35 | 1.34 | 1.33 | 1.32 | 1.31 | 1.29     |  |
| 21                                                | 1.40                                   | 1.48 | 1.48 | 1.46 | 1.44 | 1.43 | 1.42 | 1.41 | 1.40 | 1.39 | 1.38 | 1.37 | 1.35 | 1.34 | 1.33 | 1.32 | 1.31 | 1.30 | 1.28     |  |
| 22                                                | 1.40                                   | 1.48 | 1.47 | 1.45 | 1.44 | 1.42 | 1.41 | 1.40 | 1.39 | 1.39 | 1.37 | 1.36 | 1.34 | 1.33 | 1.32 | 1.31 | 1.30 | 1.29 | 1.28     |  |
| 23                                                | 1.39                                   | 1.47 | 1.47 | 1.45 | 1.43 | 1.42 | 1.41 | 1.40 | 1.39 | 1.38 | 1.37 | 1.35 | 1.34 | 1.33 | 1.32 | 1.31 | 1.30 | 1.28 | 1.27     |  |
| 24                                                | 1.39                                   | 1.47 | 1.46 | 1.44 | 1.43 | 1.41 | 1.40 | 1.39 | 1.38 | 1.38 | 1.36 | 1.35 | 1.33 | 1.32 | 1.31 | 1.30 | 1.29 | 1.28 | 1.26     |  |
| 25                                                | 1.39                                   | 1.47 | 1.46 | 1.44 | 1.42 | 1.41 | 1.40 | 1.39 | 1.38 | 1.37 | 1.36 | 1.34 | 1.33 | 1.32 | 1.31 | 1.29 | 1.28 | 1.27 | 1.25     |  |
| 26                                                | 1.38                                   | 1.46 | 1.45 | 1.44 | 1.42 | 1.41 | 1.39 | 1.38 | 1.37 | 1.37 | 1.35 | 1.34 | 1.32 | 1.31 | 1.30 | 1.29 | 1.28 | 1.26 | 1.25     |  |
| 27                                                | 1.38                                   | 1.46 | 1.45 | 1.43 | 1.42 | 1.40 | 1.39 | 1.38 | 1.37 | 1.36 | 1.35 | 1.33 | 1.32 | 1.31 | 1.30 | 1.28 | 1.27 | 1.26 | 1.24     |  |
| 28                                                | 1.38                                   | 1.46 | 1.45 | 1.43 | 1.41 | 1.40 | 1.39 | 1.38 | 1.37 | 1.36 | 1.34 | 1.33 | 1.31 | 1.30 | 1.29 | 1.28 | 1.27 | 1.25 | 1.24     |  |
| 29                                                | 1.38                                   | 1.45 | 1.45 | 1.43 | 1.41 | 1.40 | 1.38 | 1.37 | 1.36 | 1.35 | 1.34 | 1.32 | 1.31 | 1.30 | 1.29 | 1.27 | 1.26 | 1.25 | 1.23     |  |
| 30                                                | 1.38                                   | 1.45 | 1.44 | 1.42 | 1.41 | 1.39 | 1.38 | 1.37 | 1.36 | 1.35 | 1.34 | 1.32 | 1.30 | 1.29 | 1.28 | 1.27 | 1.26 | 1.24 | 1.23     |  |
| 40                                                | 1.36                                   | 1.44 | 1.42 | 1.40 | 1.39 | 1.37 | 1.36 | 1.35 | 1.34 | 1.33 | 1.31 | 1.30 | 1.28 | 1.26 | 1.25 | 1.24 | 1.22 | 1.21 | 1.19     |  |
| 60                                                | 1.35                                   | 1.42 | 1.41 | 1.38 | 1.37 | 1.35 | 1.33 | 1.32 | 1.31 | 1.30 | 1.29 | 1.27 | 1.25 | 1.24 | 1.22 | 1.21 | 1.19 | 1.17 | 1.15     |  |
| 120                                               | 1.34                                   | 1.40 | 1.39 | 1.37 | 1.35 | 1.33 | 1.31 | 1.30 | 1.29 | 1.28 | 1.26 | 1.24 | 1.22 | 1.21 | 1.19 | 1.18 | 1.16 | 1.13 | 1.10     |  |
| $\infty$                                          | 1.32                                   | 1.39 | 1.37 | 1.35 | 1.33 | 1.31 | 1.29 | 1.28 | 1.27 | 1.25 | 1.24 | 1.22 | 1.19 | 1.18 | 1.16 | 1.14 | 1.12 | 1.08 | 1.00     |  |

This table was generated using MINITAB.

Table B.6B  
F Distribution .90 Quantiles

| $\nu_2$<br>(Denominator<br>Degrees of<br>Freedom) | $\nu_1$ (Numerator Degrees of Freedom) |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |          |  |
|---------------------------------------------------|----------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|--|
|                                                   | 1                                      | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    | 12    | 15    | 20    | 24    | 30    | 40    | 60    | 120   | $\infty$ |  |
| 1                                                 | 39.86                                  | 49.50 | 53.59 | 55.84 | 57.24 | 58.20 | 58.90 | 59.44 | 59.85 | 60.20 | 60.70 | 61.22 | 61.74 | 62.00 | 62.27 | 62.53 | 62.79 | 63.05 | 63.33    |  |
| 2                                                 | 8.53                                   | 9.00  | 9.16  | 9.24  | 9.29  | 9.33  | 9.35  | 9.37  | 9.38  | 9.39  | 9.41  | 9.42  | 9.44  | 9.45  | 9.46  | 9.47  | 9.47  | 9.48  | 9.49     |  |
| 3                                                 | 5.54                                   | 5.46  | 5.39  | 5.34  | 5.31  | 5.28  | 5.27  | 5.25  | 5.24  | 5.23  | 5.22  | 5.20  | 5.18  | 5.18  | 5.17  | 5.16  | 5.15  | 5.14  | 5.13     |  |
| 4                                                 | 4.54                                   | 4.32  | 4.19  | 4.11  | 4.05  | 4.01  | 3.98  | 3.95  | 3.94  | 3.92  | 3.90  | 3.87  | 3.84  | 3.83  | 3.82  | 3.80  | 3.79  | 3.78  | 3.76     |  |
| 5                                                 | 4.06                                   | 3.78  | 3.62  | 3.52  | 3.45  | 3.40  | 3.37  | 3.34  | 3.32  | 3.30  | 3.27  | 3.24  | 3.21  | 3.19  | 3.17  | 3.16  | 3.14  | 3.12  | 3.10     |  |
| 6                                                 | 3.78                                   | 3.46  | 3.29  | 3.18  | 3.11  | 3.05  | 3.01  | 2.98  | 2.96  | 2.94  | 2.90  | 2.87  | 2.84  | 2.82  | 2.80  | 2.78  | 2.76  | 2.74  | 2.72     |  |
| 7                                                 | 3.59                                   | 3.26  | 3.07  | 2.96  | 2.88  | 2.83  | 2.78  | 2.75  | 2.72  | 2.70  | 2.67  | 2.63  | 2.59  | 2.58  | 2.56  | 2.54  | 2.51  | 2.49  | 2.47     |  |
| 8                                                 | 3.46                                   | 3.11  | 2.92  | 2.81  | 2.73  | 2.67  | 2.62  | 2.59  | 2.56  | 2.54  | 2.50  | 2.46  | 2.42  | 2.40  | 2.38  | 2.36  | 2.34  | 2.32  | 2.29     |  |
| 9                                                 | 3.36                                   | 3.01  | 2.81  | 2.69  | 2.61  | 2.55  | 2.51  | 2.47  | 2.44  | 2.42  | 2.38  | 2.34  | 2.30  | 2.28  | 2.25  | 2.23  | 2.21  | 2.18  | 2.16     |  |
| 10                                                | 3.28                                   | 2.92  | 2.73  | 2.61  | 2.52  | 2.46  | 2.41  | 2.38  | 2.35  | 2.32  | 2.28  | 2.24  | 2.20  | 2.18  | 2.16  | 2.13  | 2.11  | 2.08  | 2.06     |  |
| 11                                                | 3.23                                   | 2.86  | 2.66  | 2.54  | 2.45  | 2.39  | 2.34  | 2.30  | 2.27  | 2.25  | 2.21  | 2.17  | 2.12  | 2.10  | 2.08  | 2.05  | 2.03  | 2.00  | 1.97     |  |
| 12                                                | 3.18                                   | 2.81  | 2.61  | 2.48  | 2.39  | 2.33  | 2.28  | 2.24  | 2.21  | 2.19  | 2.15  | 2.10  | 2.06  | 2.04  | 2.01  | 1.99  | 1.96  | 1.93  | 1.90     |  |
| 13                                                | 3.14                                   | 2.76  | 2.56  | 2.43  | 2.35  | 2.28  | 2.23  | 2.20  | 2.16  | 2.14  | 2.10  | 2.05  | 2.01  | 1.98  | 1.96  | 1.93  | 1.90  | 1.88  | 1.85     |  |
| 14                                                | 3.10                                   | 2.73  | 2.52  | 2.39  | 2.31  | 2.24  | 2.19  | 2.15  | 2.12  | 2.10  | 2.05  | 2.01  | 1.96  | 1.94  | 1.91  | 1.89  | 1.86  | 1.83  | 1.80     |  |
| 15                                                | 3.07                                   | 2.70  | 2.49  | 2.36  | 2.27  | 2.21  | 2.16  | 2.12  | 2.09  | 2.06  | 2.02  | 1.97  | 1.92  | 1.90  | 1.87  | 1.85  | 1.82  | 1.79  | 1.76     |  |
| 16                                                | 3.05                                   | 2.67  | 2.46  | 2.33  | 2.24  | 2.18  | 2.13  | 2.09  | 2.06  | 2.03  | 1.99  | 1.94  | 1.89  | 1.87  | 1.84  | 1.81  | 1.78  | 1.75  | 1.72     |  |
| 17                                                | 3.03                                   | 2.64  | 2.44  | 2.31  | 2.22  | 2.15  | 2.10  | 2.06  | 2.03  | 2.00  | 1.96  | 1.91  | 1.86  | 1.84  | 1.81  | 1.78  | 1.75  | 1.72  | 1.69     |  |
| 18                                                | 3.01                                   | 2.62  | 2.42  | 2.29  | 2.20  | 2.13  | 2.08  | 2.04  | 2.00  | 1.98  | 1.93  | 1.89  | 1.84  | 1.81  | 1.78  | 1.75  | 1.72  | 1.69  | 1.66     |  |
| 19                                                | 2.99                                   | 2.61  | 2.40  | 2.27  | 2.18  | 2.11  | 2.06  | 2.02  | 1.98  | 1.96  | 1.91  | 1.86  | 1.81  | 1.79  | 1.76  | 1.73  | 1.70  | 1.67  | 1.63     |  |
| 20                                                | 2.97                                   | 2.59  | 2.38  | 2.25  | 2.16  | 2.09  | 2.04  | 2.00  | 1.96  | 1.94  | 1.89  | 1.84  | 1.79  | 1.77  | 1.74  | 1.71  | 1.68  | 1.64  | 1.61     |  |
| 21                                                | 2.96                                   | 2.57  | 2.36  | 2.23  | 2.14  | 2.08  | 2.02  | 1.98  | 1.95  | 1.92  | 1.87  | 1.83  | 1.78  | 1.75  | 1.72  | 1.69  | 1.66  | 1.62  | 1.59     |  |
| 22                                                | 2.95                                   | 2.56  | 2.35  | 2.22  | 2.13  | 2.06  | 2.01  | 1.97  | 1.93  | 1.90  | 1.86  | 1.81  | 1.76  | 1.73  | 1.70  | 1.67  | 1.64  | 1.60  | 1.57     |  |
| 23                                                | 2.94                                   | 2.55  | 2.34  | 2.21  | 2.11  | 2.05  | 1.99  | 1.95  | 1.92  | 1.89  | 1.84  | 1.80  | 1.74  | 1.72  | 1.69  | 1.66  | 1.62  | 1.59  | 1.55     |  |
| 24                                                | 2.93                                   | 2.54  | 2.33  | 2.19  | 2.10  | 2.04  | 1.98  | 1.94  | 1.91  | 1.88  | 1.83  | 1.78  | 1.73  | 1.70  | 1.67  | 1.64  | 1.61  | 1.57  | 1.53     |  |
| 25                                                | 2.92                                   | 2.53  | 2.32  | 2.18  | 2.09  | 2.02  | 1.97  | 1.93  | 1.89  | 1.87  | 1.82  | 1.77  | 1.72  | 1.69  | 1.66  | 1.63  | 1.59  | 1.56  | 1.52     |  |
| 26                                                | 2.91                                   | 2.52  | 2.31  | 2.17  | 2.08  | 2.01  | 1.96  | 1.92  | 1.88  | 1.86  | 1.81  | 1.76  | 1.71  | 1.68  | 1.65  | 1.61  | 1.58  | 1.54  | 1.50     |  |
| 27                                                | 2.90                                   | 2.51  | 2.30  | 2.17  | 2.07  | 2.00  | 1.95  | 1.91  | 1.87  | 1.85  | 1.80  | 1.75  | 1.70  | 1.67  | 1.64  | 1.60  | 1.57  | 1.53  | 1.49     |  |
| 28                                                | 2.89                                   | 2.50  | 2.29  | 2.16  | 2.06  | 2.00  | 1.94  | 1.90  | 1.87  | 1.84  | 1.79  | 1.74  | 1.69  | 1.66  | 1.63  | 1.59  | 1.56  | 1.52  | 1.48     |  |
| 29                                                | 2.89                                   | 2.50  | 2.28  | 2.15  | 2.06  | 1.99  | 1.93  | 1.89  | 1.86  | 1.83  | 1.78  | 1.73  | 1.68  | 1.65  | 1.62  | 1.58  | 1.55  | 1.51  | 1.47     |  |
| 30                                                | 2.88                                   | 2.49  | 2.28  | 2.14  | 2.05  | 1.98  | 1.93  | 1.88  | 1.85  | 1.82  | 1.77  | 1.72  | 1.67  | 1.64  | 1.61  | 1.57  | 1.54  | 1.50  | 1.46     |  |
| 40                                                | 2.84                                   | 2.44  | 2.23  | 2.09  | 2.00  | 1.93  | 1.87  | 1.83  | 1.79  | 1.76  | 1.71  | 1.66  | 1.61  | 1.57  | 1.54  | 1.51  | 1.47  | 1.42  | 1.38     |  |
| 60                                                | 2.79                                   | 2.39  | 2.18  | 2.04  | 1.95  | 1.87  | 1.82  | 1.77  | 1.74  | 1.71  | 1.66  | 1.60  | 1.54  | 1.51  | 1.48  | 1.44  | 1.40  | 1.35  | 1.29     |  |
| 120                                               | 2.75                                   | 2.35  | 2.13  | 1.99  | 1.90  | 1.82  | 1.77  | 1.72  | 1.68  | 1.65  | 1.60  | 1.55  | 1.48  | 1.45  | 1.41  | 1.37  | 1.32  | 1.26  | 1.19     |  |
| $\infty$                                          | 2.71                                   | 2.30  | 2.08  | 1.94  | 1.85  | 1.77  | 1.72  | 1.67  | 1.63  | 1.60  | 1.55  | 1.49  | 1.42  | 1.38  | 1.34  | 1.30  | 1.24  | 1.17  | 1.00     |  |

This table was generated using MINITAB



Table B.6C  
F Distribution .95 Quantiles

| $\nu_2$<br>(Denominator<br>Degrees of<br>Freedom) | $\nu_1$ (Numerator Degrees of Freedom) |        |        |        |        |        |        |        |        |        |
|---------------------------------------------------|----------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                                                   | 1                                      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     |
| 1                                                 | 161.44                                 | 199.50 | 215.69 | 224.57 | 230.16 | 233.98 | 236.78 | 238.89 | 240.55 | 241.89 |
| 2                                                 | 18.51                                  | 19.00  | 19.16  | 19.25  | 19.30  | 19.33  | 19.35  | 19.37  | 19.39  | 19.40  |
| 3                                                 | 10.13                                  | 9.55   | 9.28   | 9.12   | 9.01   | 8.94   | 8.89   | 8.85   | 8.81   | 8.79   |
| 4                                                 | 7.71                                   | 6.94   | 6.59   | 6.39   | 6.26   | 6.16   | 6.09   | 6.04   | 6.00   | 5.96   |
| 5                                                 | 6.61                                   | 5.79   | 5.41   | 5.19   | 5.05   | 4.95   | 4.88   | 4.82   | 4.77   | 4.74   |
| 6                                                 | 5.99                                   | 5.14   | 4.76   | 4.53   | 4.39   | 4.28   | 4.21   | 4.15   | 4.10   | 4.06   |
| 7                                                 | 5.59                                   | 4.74   | 4.35   | 4.12   | 3.97   | 3.87   | 3.79   | 3.73   | 3.68   | 3.64   |
| 8                                                 | 5.32                                   | 4.46   | 4.07   | 3.84   | 3.69   | 3.58   | 3.50   | 3.44   | 3.39   | 3.35   |
| 9                                                 | 5.12                                   | 4.26   | 3.86   | 3.63   | 3.48   | 3.37   | 3.29   | 3.23   | 3.18   | 3.14   |
| 10                                                | 4.96                                   | 4.10   | 3.71   | 3.48   | 3.33   | 3.22   | 3.14   | 3.07   | 3.02   | 2.98   |
| 11                                                | 4.84                                   | 3.98   | 3.59   | 3.36   | 3.20   | 3.09   | 3.01   | 2.95   | 2.90   | 2.85   |
| 12                                                | 4.75                                   | 3.89   | 3.49   | 3.26   | 3.11   | 3.00   | 2.91   | 2.85   | 2.80   | 2.75   |
| 13                                                | 4.67                                   | 3.81   | 3.41   | 3.18   | 3.03   | 2.92   | 2.83   | 2.77   | 2.71   | 2.67   |
| 14                                                | 4.60                                   | 3.74   | 3.34   | 3.11   | 2.96   | 2.85   | 2.76   | 2.70   | 2.65   | 2.60   |
| 15                                                | 4.54                                   | 3.68   | 3.29   | 3.06   | 2.90   | 2.79   | 2.71   | 2.64   | 2.59   | 2.54   |
| 16                                                | 4.49                                   | 3.63   | 3.24   | 3.01   | 2.85   | 2.74   | 2.66   | 2.59   | 2.54   | 2.49   |
| 17                                                | 4.45                                   | 3.59   | 3.20   | 2.96   | 2.81   | 2.70   | 2.61   | 2.55   | 2.49   | 2.45   |
| 18                                                | 4.41                                   | 3.55   | 3.16   | 2.93   | 2.77   | 2.66   | 2.58   | 2.51   | 2.46   | 2.41   |
| 19                                                | 4.38                                   | 3.52   | 3.13   | 2.90   | 2.74   | 2.63   | 2.54   | 2.48   | 2.42   | 2.38   |
| 20                                                | 4.35                                   | 3.49   | 3.10   | 2.87   | 2.71   | 2.60   | 2.51   | 2.45   | 2.39   | 2.35   |
| 21                                                | 4.32                                   | 3.47   | 3.07   | 2.84   | 2.68   | 2.57   | 2.49   | 2.42   | 2.37   | 2.32   |
| 22                                                | 4.30                                   | 3.44   | 3.05   | 2.82   | 2.66   | 2.55   | 2.46   | 2.40   | 2.34   | 2.30   |
| 23                                                | 4.28                                   | 3.42   | 3.03   | 2.80   | 2.64   | 2.53   | 2.44   | 2.37   | 2.32   | 2.27   |
| 24                                                | 4.26                                   | 3.40   | 3.01   | 2.78   | 2.62   | 2.51   | 2.42   | 2.36   | 2.30   | 2.25   |
| 25                                                | 4.24                                   | 3.39   | 2.99   | 2.76   | 2.60   | 2.49   | 2.40   | 2.34   | 2.28   | 2.24   |
| 26                                                | 4.23                                   | 3.37   | 2.98   | 2.74   | 2.59   | 2.47   | 2.39   | 2.32   | 2.27   | 2.22   |
| 27                                                | 4.21                                   | 3.35   | 2.96   | 2.73   | 2.57   | 2.46   | 2.37   | 2.31   | 2.25   | 2.20   |
| 28                                                | 4.20                                   | 3.34   | 2.95   | 2.71   | 2.56   | 2.45   | 2.36   | 2.29   | 2.24   | 2.19   |
| 29                                                | 4.18                                   | 3.33   | 2.93   | 2.70   | 2.55   | 2.43   | 2.35   | 2.28   | 2.22   | 2.18   |
| 30                                                | 4.17                                   | 3.32   | 2.92   | 2.69   | 2.53   | 2.42   | 2.33   | 2.27   | 2.21   | 2.16   |
| 40                                                | 4.08                                   | 3.23   | 2.84   | 2.61   | 2.45   | 2.34   | 2.25   | 2.18   | 2.12   | 2.08   |
| 60                                                | 4.00                                   | 3.15   | 2.76   | 2.53   | 2.37   | 2.25   | 2.17   | 2.10   | 2.04   | 1.99   |
| 120                                               | 3.92                                   | 3.07   | 2.68   | 2.45   | 2.29   | 2.18   | 2.09   | 2.02   | 1.96   | 1.91   |
| $\infty$                                          | 3.84                                   | 3.00   | 2.60   | 2.37   | 2.21   | 2.10   | 2.01   | 1.94   | 1.88   | 1.83   |

Table B.6C  
F Distribution of .95 Quantiles (continued)

| $\nu_2$<br>(Denominator<br>Degrees of<br>Freedom) | $\nu_1$ (Numerator Degrees of Freedom) |        |        |        |        |        |        |          |
|---------------------------------------------------|----------------------------------------|--------|--------|--------|--------|--------|--------|----------|
|                                                   | 12                                     | 15     | 20     | 24     | 30     | 40     | 60     | $\infty$ |
| 1                                                 | 243.91                                 | 245.97 | 248.02 | 249.04 | 250.07 | 251.13 | 252.18 | 253.27   |
| 2                                                 | 19.41                                  | 19.43  | 19.45  | 19.45  | 19.46  | 19.47  | 19.48  | 19.49    |
| 3                                                 | 8.74                                   | 8.70   | 8.66   | 8.64   | 8.62   | 8.59   | 8.57   | 8.55     |
| 4                                                 | 5.91                                   | 5.86   | 5.80   | 5.77   | 5.75   | 5.72   | 5.69   | 5.66     |
| 5                                                 | 4.68                                   | 4.62   | 4.56   | 4.53   | 4.50   | 4.46   | 4.43   | 4.40     |
| 6                                                 | 4.00                                   | 3.94   | 3.87   | 3.84   | 3.81   | 3.77   | 3.74   | 3.70     |
| 7                                                 | 3.57                                   | 3.51   | 3.44   | 3.41   | 3.38   | 3.34   | 3.30   | 3.27     |
| 8                                                 | 3.28                                   | 3.22   | 3.15   | 3.12   | 3.08   | 3.04   | 3.01   | 2.97     |
| 9                                                 | 3.07                                   | 3.01   | 2.94   | 2.90   | 2.86   | 2.83   | 2.79   | 2.75     |
| 10                                                | 2.91                                   | 2.85   | 2.77   | 2.74   | 2.70   | 2.66   | 2.62   | 2.58     |
| 11                                                | 2.79                                   | 2.72   | 2.65   | 2.61   | 2.57   | 2.53   | 2.49   | 2.45     |
| 12                                                | 2.69                                   | 2.62   | 2.54   | 2.51   | 2.47   | 2.43   | 2.38   | 2.34     |
| 13                                                | 2.60                                   | 2.53   | 2.46   | 2.42   | 2.38   | 2.34   | 2.30   | 2.25     |
| 14                                                | 2.53                                   | 2.46   | 2.39   | 2.35   | 2.31   | 2.27   | 2.22   | 2.18     |
| 15                                                | 2.48                                   | 2.40   | 2.33   | 2.29   | 2.25   | 2.20   | 2.16   | 2.11     |
| 16                                                | 2.42                                   | 2.35   | 2.28   | 2.24   | 2.19   | 2.15   | 2.11   | 2.06     |
| 17                                                | 2.38                                   | 2.31   | 2.23   | 2.19   | 2.15   | 2.10   | 2.06   | 2.01     |
| 18                                                | 2.34                                   | 2.27   | 2.19   | 2.15   | 2.11   | 2.06   | 2.02   | 1.97     |
| 19                                                | 2.31                                   | 2.23   | 2.16   | 2.11   | 2.07   | 2.03   | 1.98   | 1.93     |
| 20                                                | 2.28                                   | 2.20   | 2.12   | 2.08   | 2.04   | 1.99   | 1.95   | 1.90     |
| 21                                                | 2.25                                   | 2.18   | 2.10   | 2.05   | 2.01   | 1.96   | 1.92   | 1.87     |
| 22                                                | 2.23                                   | 2.15   | 2.07   | 2.03   | 1.98   | 1.94   | 1.89   | 1.84     |
| 23                                                | 2.20                                   | 2.13   | 2.05   | 2.01   | 1.96   | 1.91   | 1.86   | 1.81     |
| 24                                                | 2.18                                   | 2.11   | 2.03   | 1.98   | 1.94   | 1.89   | 1.84   | 1.79     |
| 25                                                | 2.16                                   | 2.09   | 2.01   | 1.96   | 1.92   | 1.87   | 1.82   | 1.77     |
| 26                                                | 2.15                                   | 2.07   | 1.99   | 1.95   | 1.90   | 1.85   | 1.80   | 1.75     |
| 27                                                | 2.13                                   | 2.06   | 1.97   | 1.93   | 1.88   | 1.84   | 1.79   | 1.73     |
| 28                                                | 2.12                                   | 2.04   | 1.96   | 1.91   | 1.87   | 1.82   | 1.77   | 1.71     |
| 29                                                | 2.10                                   | 2.03   | 1.94   | 1.90   | 1.85   | 1.81   | 1.75   | 1.70     |
| 30                                                | 2.09                                   | 2.01   | 1.93   | 1.89   | 1.84   | 1.79   | 1.74   | 1.68     |
| 40                                                | 2.00                                   | 1.92   | 1.84   | 1.79   | 1.74   | 1.69   | 1.64   | 1.58     |
| 60                                                | 1.92                                   | 1.84   | 1.75   | 1.70   | 1.65   | 1.59   | 1.53   | 1.47     |
| 120                                               | 1.83                                   | 1.75   | 1.66   | 1.61   | 1.55   | 1.50   | 1.43   | 1.35     |
| $\infty$                                          | 1.75                                   | 1.67   | 1.57   | 1.52   | 1.46   | 1.39   | 1.32   | 1.22     |

This table was generated using MINTTAB.

Table B.6D  
F Distribution .99 Quantiles

| $\nu_2$<br>(Denominator<br>Degrees of<br>Freedom) | $\nu_1$ (Numerator Degrees of Freedom) |       |       |       |       |       |       |       |       |       |
|---------------------------------------------------|----------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                                   | 1                                      | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    |
| 1                                                 | 4052                                   | 4999  | 5403  | 5625  | 5764  | 5859  | 5929  | 5981  | 6023  | 6055  |
| 2                                                 | 98.51                                  | 99.00 | 99.17 | 99.25 | 99.30 | 99.33 | 99.35 | 99.38 | 99.39 | 99.40 |
| 3                                                 | 34.12                                  | 30.82 | 29.46 | 28.71 | 28.24 | 27.91 | 27.67 | 27.49 | 27.35 | 27.23 |
| 4                                                 | 21.20                                  | 18.00 | 16.69 | 15.98 | 15.52 | 15.21 | 14.98 | 14.80 | 14.66 | 14.55 |
| 5                                                 | 16.26                                  | 13.27 | 12.06 | 11.39 | 10.97 | 10.67 | 10.46 | 10.29 | 10.16 | 10.05 |
| 6                                                 | 13.75                                  | 10.92 | 9.78  | 9.15  | 8.75  | 8.47  | 8.26  | 8.10  | 7.98  | 7.87  |
| 7                                                 | 12.25                                  | 9.55  | 8.45  | 7.85  | 7.46  | 7.19  | 6.99  | 6.84  | 6.72  | 6.62  |
| 8                                                 | 11.26                                  | 8.65  | 7.59  | 7.01  | 6.63  | 6.37  | 6.18  | 6.03  | 5.91  | 5.81  |
| 9                                                 | 10.56                                  | 8.02  | 6.99  | 6.42  | 6.06  | 5.80  | 5.61  | 5.47  | 5.35  | 5.26  |
| 10                                                | 10.04                                  | 7.56  | 6.55  | 5.99  | 5.64  | 5.39  | 5.20  | 5.06  | 4.94  | 4.85  |
| 11                                                | 9.65                                   | 7.21  | 6.22  | 5.67  | 5.32  | 5.07  | 4.89  | 4.74  | 4.63  | 4.54  |
| 12                                                | 9.33                                   | 6.93  | 5.95  | 5.41  | 5.06  | 4.82  | 4.64  | 4.50  | 4.39  | 4.30  |
| 13                                                | 9.07                                   | 6.70  | 5.74  | 5.21  | 4.86  | 4.62  | 4.44  | 4.30  | 4.19  | 4.10  |
| 14                                                | 8.86                                   | 6.51  | 5.56  | 5.04  | 4.69  | 4.46  | 4.28  | 4.14  | 4.03  | 3.94  |
| 15                                                | 8.68                                   | 6.36  | 5.42  | 4.89  | 4.56  | 4.32  | 4.14  | 4.00  | 3.89  | 3.80  |
| 16                                                | 8.53                                   | 6.23  | 5.29  | 4.77  | 4.44  | 4.20  | 4.03  | 3.89  | 3.78  | 3.69  |
| 17                                                | 8.40                                   | 6.11  | 5.18  | 4.67  | 4.34  | 4.10  | 3.93  | 3.79  | 3.68  | 3.59  |
| 18                                                | 8.29                                   | 6.01  | 5.09  | 4.58  | 4.25  | 4.01  | 3.84  | 3.71  | 3.60  | 3.51  |
| 19                                                | 8.19                                   | 5.93  | 5.01  | 4.50  | 4.17  | 3.94  | 3.77  | 3.63  | 3.52  | 3.43  |
| 20                                                | 8.10                                   | 5.85  | 4.94  | 4.43  | 4.10  | 3.87  | 3.70  | 3.56  | 3.46  | 3.37  |
| 21                                                | 8.02                                   | 5.78  | 4.87  | 4.37  | 4.04  | 3.81  | 3.64  | 3.51  | 3.40  | 3.31  |
| 22                                                | 7.95                                   | 5.72  | 4.82  | 4.31  | 3.99  | 3.76  | 3.59  | 3.45  | 3.35  | 3.26  |
| 23                                                | 7.88                                   | 5.66  | 4.76  | 4.26  | 3.94  | 3.71  | 3.54  | 3.41  | 3.30  | 3.21  |
| 24                                                | 7.82                                   | 5.61  | 4.72  | 4.22  | 3.90  | 3.67  | 3.50  | 3.36  | 3.26  | 3.17  |
| 25                                                | 7.77                                   | 5.57  | 4.68  | 4.18  | 3.85  | 3.63  | 3.46  | 3.32  | 3.22  | 3.13  |
| 26                                                | 7.72                                   | 5.53  | 4.64  | 4.14  | 3.82  | 3.59  | 3.42  | 3.29  | 3.18  | 3.09  |
| 27                                                | 7.68                                   | 5.49  | 4.60  | 4.11  | 3.78  | 3.56  | 3.39  | 3.26  | 3.15  | 3.06  |
| 28                                                | 7.64                                   | 5.45  | 4.57  | 4.07  | 3.75  | 3.53  | 3.36  | 3.23  | 3.12  | 3.03  |
| 29                                                | 7.60                                   | 5.42  | 4.54  | 4.04  | 3.73  | 3.50  | 3.33  | 3.20  | 3.09  | 3.00  |
| 30                                                | 7.56                                   | 5.39  | 4.51  | 4.02  | 3.70  | 3.47  | 3.30  | 3.17  | 3.07  | 2.98  |
| 40                                                | 7.31                                   | 5.18  | 4.31  | 3.83  | 3.51  | 3.29  | 3.12  | 2.99  | 2.89  | 2.80  |
| 60                                                | 7.08                                   | 4.98  | 4.13  | 3.65  | 3.34  | 3.12  | 2.95  | 2.82  | 2.72  | 2.63  |
| 120                                               | 6.85                                   | 4.79  | 3.95  | 3.48  | 3.17  | 2.96  | 2.79  | 2.66  | 2.56  | 2.47  |
| $\infty$                                          | 6.63                                   | 4.61  | 3.78  | 3.32  | 3.02  | 2.80  | 2.64  | 2.51  | 2.41  | 2.32  |

Table B.6D  
F Distribution of .99 Quantiles (continued)

| $\nu_2$<br>(Denominator<br>Degrees of<br>Freedom) | $\nu_1$ (Numerator Degrees of Freedom) |       |       |       |       |       |       |       |          |  |
|---------------------------------------------------|----------------------------------------|-------|-------|-------|-------|-------|-------|-------|----------|--|
|                                                   | 12                                     | 15    | 20    | 24    | 30    | 40    | 60    | 120   | $\infty$ |  |
| 1                                                 | 6107                                   | 6157  | 6209  | 6235  | 6260  | 6287  | 6312  | 6339  | 6366     |  |
| 2                                                 | 99.41                                  | 99.43 | 99.44 | 99.45 | 99.47 | 99.47 | 99.48 | 99.49 | 99.50    |  |
| 3                                                 | 27.05                                  | 26.87 | 26.69 | 26.60 | 26.51 | 26.41 | 26.32 | 26.22 | 26.13    |  |
| 4                                                 | 14.37                                  | 14.20 | 14.02 | 13.93 | 13.84 | 13.75 | 13.65 | 13.56 | 13.46    |  |
| 5                                                 | 9.89                                   | 9.72  | 9.55  | 9.47  | 9.38  | 9.29  | 9.20  | 9.11  | 9.02     |  |
| 6                                                 | 7.72                                   | 7.56  | 7.40  | 7.31  | 7.23  | 7.14  | 7.06  | 6.97  | 6.88     |  |
| 7                                                 | 6.47                                   | 6.31  | 6.16  | 6.07  | 5.99  | 5.91  | 5.82  | 5.74  | 5.65     |  |
| 8                                                 | 5.67                                   | 5.52  | 5.36  | 5.28  | 5.20  | 5.12  | 5.03  | 4.95  | 4.86     |  |
| 9                                                 | 5.11                                   | 4.96  | 4.81  | 4.73  | 4.65  | 4.57  | 4.48  | 4.40  | 4.31     |  |
| 10                                                | 4.71                                   | 4.56  | 4.41  | 4.33  | 4.25  | 4.17  | 4.08  | 4.00  | 3.91     |  |
| 11                                                | 4.40                                   | 4.25  | 4.10  | 4.02  | 3.94  | 3.86  | 3.78  | 3.69  | 3.60     |  |
| 12                                                | 4.16                                   | 4.01  | 3.86  | 3.78  | 3.70  | 3.62  | 3.54  | 3.45  | 3.36     |  |
| 13                                                | 3.96                                   | 3.82  | 3.66  | 3.59  | 3.51  | 3.43  | 3.34  | 3.25  | 3.17     |  |
| 14                                                | 3.80                                   | 3.66  | 3.51  | 3.43  | 3.35  | 3.27  | 3.18  | 3.09  | 3.00     |  |
| 15                                                | 3.67                                   | 3.52  | 3.37  | 3.29  | 3.21  | 3.13  | 3.05  | 2.96  | 2.87     |  |
| 16                                                | 3.55                                   | 3.41  | 3.26  | 3.18  | 3.10  | 3.02  | 2.93  | 2.84  | 2.75     |  |
| 17                                                | 3.46                                   | 3.31  | 3.16  | 3.08  | 3.00  | 2.92  | 2.83  | 2.75  | 2.65     |  |
| 18                                                | 3.37                                   | 3.23  | 3.08  | 3.00  | 2.92  | 2.84  | 2.75  | 2.66  | 2.57     |  |
| 19                                                | 3.30                                   | 3.15  | 3.00  | 2.92  | 2.84  | 2.76  | 2.67  | 2.58  | 2.49     |  |
| 20                                                | 3.23                                   | 3.09  | 2.94  | 2.86  | 2.78  | 2.69  | 2.61  | 2.52  | 2.42     |  |
| 21                                                | 3.17                                   | 3.03  | 2.88  | 2.80  | 2.72  | 2.64  | 2.55  | 2.46  | 2.36     |  |
| 22                                                | 3.12                                   | 2.98  | 2.83  | 2.75  | 2.67  | 2.58  | 2.50  | 2.40  | 2.31     |  |
| 23                                                | 3.07                                   | 2.93  | 2.78  | 2.70  | 2.62  | 2.54  | 2.45  | 2.35  | 2.26     |  |
| 24                                                | 3.03                                   | 2.89  | 2.74  | 2.66  | 2.58  | 2.49  | 2.40  | 2.31  | 2.21     |  |
| 25                                                | 2.99                                   | 2.85  | 2.70  | 2.62  | 2.54  | 2.45  | 2.36  | 2.27  | 2.17     |  |
| 26                                                | 2.96                                   | 2.81  | 2.66  | 2.58  | 2.50  | 2.42  | 2.33  | 2.23  | 2.13     |  |
| 27                                                | 2.93                                   | 2.78  | 2.63  | 2.55  | 2.47  | 2.38  | 2.29  | 2.20  | 2.10     |  |
| 28                                                | 2.90                                   | 2.75  | 2.60  | 2.52  | 2.44  | 2.35  | 2.26  | 2.17  | 2.06     |  |
| 29                                                | 2.87                                   | 2.73  | 2.57  | 2.49  | 2.41  | 2.33  | 2.23  | 2.14  | 2.03     |  |
| 30                                                | 2.84                                   | 2.70  | 2.55  | 2.47  | 2.39  | 2.30  | 2.21  | 2.11  | 2.01     |  |
| 40                                                | 2.66                                   | 2.52  | 2.37  | 2.29  | 2.20  | 2.11  | 2.02  | 1.92  | 1.80     |  |
| 60                                                | 2.50                                   | 2.35  | 2.20  | 2.12  | 2.03  | 1.94  | 1.84  | 1.73  | 1.60     |  |
| 120                                               | 2.34                                   | 2.19  | 2.03  | 1.95  | 1.86  | 1.76  | 1.66  | 1.53  | 1.38     |  |
| $\infty$                                          | 2.18                                   | 2.04  | 1.88  | 1.79  | 1.70  | 1.59  | 1.47  | 1.32  | 1.00     |  |

This table was generated using MINITAB.



Table B.6E  
F Distribution .999 Quantiles

| $\nu_2$<br>(Denominator<br>Degrees of<br>Freedom) | $\nu_1$ (Numerator Degrees of Freedom) |        |        |        |        |        |        |        |        |        |
|---------------------------------------------------|----------------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                                                   | 1                                      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     |
| 1                                                 | 405261                                 | 499996 | 540349 | 562463 | 576409 | 585904 | 592890 | 598185 | 602359 | 605671 |
| 2                                                 | 998.55                                 | 999.01 | 999.23 | 999.26 | 999.29 | 999.38 | 999.40 | 999.35 | 999.45 | 999.41 |
| 3                                                 | 167.03                                 | 148.50 | 141.11 | 137.10 | 134.58 | 132.85 | 131.58 | 130.62 | 129.86 | 129.25 |
| 4                                                 | 74.14                                  | 61.25  | 56.18  | 53.44  | 51.71  | 50.53  | 49.66  | 49.00  | 48.48  | 48.05  |
| 5                                                 | 47.18                                  | 37.12  | 33.20  | 31.08  | 29.75  | 28.83  | 28.16  | 27.65  | 27.24  | 26.92  |
| 6                                                 | 35.51                                  | 27.00  | 23.70  | 21.92  | 20.80  | 20.03  | 19.46  | 19.03  | 18.69  | 18.41  |
| 7                                                 | 29.24                                  | 21.69  | 18.77  | 17.20  | 16.21  | 15.52  | 15.02  | 14.63  | 14.33  | 14.08  |
| 8                                                 | 25.41                                  | 18.49  | 15.83  | 14.39  | 13.48  | 12.86  | 12.40  | 12.05  | 11.77  | 11.54  |
| 9                                                 | 22.86                                  | 16.39  | 13.90  | 12.56  | 11.71  | 11.13  | 10.70  | 10.37  | 10.11  | 9.89   |
| 10                                                | 21.04                                  | 14.91  | 12.55  | 11.28  | 10.48  | 9.93   | 9.52   | 9.20   | 8.96   | 8.75   |
| 11                                                | 19.69                                  | 13.81  | 11.56  | 10.35  | 9.58   | 9.05   | 8.66   | 8.35   | 8.12   | 7.92   |
| 12                                                | 18.64                                  | 12.97  | 10.80  | 9.63   | 8.89   | 8.38   | 8.00   | 7.71   | 7.48   | 7.29   |
| 13                                                | 17.82                                  | 12.31  | 10.21  | 9.07   | 8.35   | 7.86   | 7.49   | 7.21   | 6.98   | 6.80   |
| 14                                                | 17.14                                  | 11.78  | 9.73   | 8.62   | 7.92   | 7.44   | 7.08   | 6.80   | 6.58   | 6.40   |
| 15                                                | 16.59                                  | 11.34  | 9.34   | 8.25   | 7.57   | 7.09   | 6.74   | 6.47   | 6.26   | 6.08   |
| 16                                                | 16.12                                  | 10.97  | 9.01   | 7.94   | 7.27   | 6.80   | 6.46   | 6.19   | 5.98   | 5.81   |
| 17                                                | 15.72                                  | 10.66  | 8.73   | 7.68   | 7.02   | 6.56   | 6.22   | 5.96   | 5.75   | 5.58   |
| 18                                                | 15.38                                  | 10.39  | 8.49   | 7.46   | 6.81   | 6.35   | 6.02   | 5.76   | 5.56   | 5.39   |
| 19                                                | 15.08                                  | 10.16  | 8.28   | 7.27   | 6.62   | 6.18   | 5.85   | 5.59   | 5.39   | 5.22   |
| 20                                                | 14.82                                  | 9.95   | 8.10   | 7.10   | 6.46   | 6.02   | 5.69   | 5.44   | 5.24   | 5.08   |
| 21                                                | 14.59                                  | 9.77   | 7.94   | 6.95   | 6.32   | 5.88   | 5.56   | 5.31   | 5.11   | 4.95   |
| 22                                                | 14.38                                  | 9.61   | 7.80   | 6.81   | 6.19   | 5.76   | 5.44   | 5.19   | 4.99   | 4.83   |
| 23                                                | 14.20                                  | 9.47   | 7.67   | 6.70   | 6.08   | 5.65   | 5.33   | 5.09   | 4.89   | 4.73   |
| 24                                                | 14.03                                  | 9.34   | 7.55   | 6.59   | 5.98   | 5.55   | 5.23   | 4.99   | 4.80   | 4.64   |
| 25                                                | 13.88                                  | 9.22   | 7.45   | 6.49   | 5.89   | 5.46   | 5.15   | 4.91   | 4.71   | 4.56   |
| 26                                                | 13.74                                  | 9.12   | 7.36   | 6.41   | 5.80   | 5.38   | 5.07   | 4.83   | 4.64   | 4.48   |
| 27                                                | 13.61                                  | 9.02   | 7.27   | 6.33   | 5.73   | 5.31   | 5.00   | 4.76   | 4.57   | 4.41   |
| 28                                                | 13.50                                  | 8.93   | 7.19   | 6.25   | 5.66   | 5.24   | 4.93   | 4.69   | 4.50   | 4.35   |
| 29                                                | 13.39                                  | 8.85   | 7.12   | 6.19   | 5.59   | 5.18   | 4.87   | 4.64   | 4.45   | 4.29   |
| 30                                                | 13.29                                  | 8.77   | 7.05   | 6.12   | 5.53   | 5.12   | 4.82   | 4.58   | 4.39   | 4.24   |
| 40                                                | 12.61                                  | 8.25   | 6.59   | 5.70   | 5.13   | 4.73   | 4.44   | 4.21   | 4.02   | 3.87   |
| 60                                                | 11.97                                  | 7.77   | 6.17   | 5.31   | 4.76   | 4.37   | 4.09   | 3.86   | 3.69   | 3.54   |
| 120                                               | 11.38                                  | 7.32   | 5.78   | 4.95   | 4.42   | 4.04   | 3.77   | 3.55   | 3.38   | 3.24   |
| $\infty$                                          | 10.83                                  | 6.91   | 5.42   | 4.62   | 4.10   | 3.74   | 3.47   | 3.27   | 3.10   | 2.96   |

Table B.6E  
F Distribution .999 Quantiles (continued)

| $\nu_2$<br>(Denominator<br>Degrees of<br>Freedom) | $\nu_1$ (Numerator Degrees of Freedom) |        |        |        |        |        |        |        |          |
|---------------------------------------------------|----------------------------------------|--------|--------|--------|--------|--------|--------|--------|----------|
|                                                   | 12                                     | 15     | 20     | 24     | 30     | 40     | 60     | 120    | $\infty$ |
| 1                                                 | 610644                                 | 615766 | 620884 | 623544 | 626117 | 628724 | 631381 | 634002 | 636619   |
| 2                                                 | 999.46                                 | 999.40 | 999.44 | 999.45 | 999.47 | 999.49 | 999.50 | 999.52 | 999.50   |
| 3                                                 | 128.32                                 | 127.37 | 126.42 | 125.94 | 125.45 | 124.96 | 124.47 | 123.97 | 123.47   |
| 4                                                 | 47.41                                  | 46.76  | 46.10  | 45.77  | 45.43  | 45.09  | 44.75  | 44.40  | 44.05    |
| 5                                                 | 26.42                                  | 25.91  | 25.40  | 25.13  | 24.87  | 24.60  | 24.33  | 24.06  | 23.79    |
| 6                                                 | 17.99                                  | 17.56  | 17.12  | 16.90  | 16.67  | 16.44  | 16.21  | 15.98  | 15.75    |
| 7                                                 | 13.71                                  | 13.32  | 12.93  | 12.73  | 12.53  | 12.33  | 12.12  | 11.91  | 11.70    |
| 8                                                 | 11.19                                  | 10.84  | 10.48  | 10.30  | 10.11  | 9.92   | 9.73   | 9.53   | 9.33     |
| 9                                                 | 9.57                                   | 9.24   | 8.90   | 8.72   | 8.55   | 8.37   | 8.19   | 8.00   | 7.81     |
| 10                                                | 8.45                                   | 8.13   | 7.80   | 7.64   | 7.47   | 7.30   | 7.12   | 6.94   | 6.76     |
| 11                                                | 7.63                                   | 7.32   | 7.01   | 6.85   | 6.68   | 6.52   | 6.35   | 6.18   | 6.00     |
| 12                                                | 7.00                                   | 6.71   | 6.40   | 6.25   | 6.09   | 5.93   | 5.76   | 5.59   | 5.42     |
| 13                                                | 6.52                                   | 6.23   | 5.93   | 5.78   | 5.63   | 5.47   | 5.30   | 5.14   | 4.97     |
| 14                                                | 6.13                                   | 5.85   | 5.56   | 5.41   | 5.25   | 5.10   | 4.94   | 4.77   | 4.60     |
| 15                                                | 5.81                                   | 5.54   | 5.25   | 5.10   | 4.95   | 4.80   | 4.64   | 4.47   | 4.31     |
| 16                                                | 5.55                                   | 5.27   | 4.99   | 4.85   | 4.70   | 4.54   | 4.39   | 4.23   | 4.06     |
| 17                                                | 5.32                                   | 5.05   | 4.78   | 4.63   | 4.48   | 4.33   | 4.18   | 4.02   | 3.85     |
| 18                                                | 5.13                                   | 4.87   | 4.59   | 4.45   | 4.30   | 4.15   | 4.00   | 3.84   | 3.67     |
| 19                                                | 4.97                                   | 4.70   | 4.43   | 4.29   | 4.14   | 3.99   | 3.84   | 3.68   | 3.51     |
| 20                                                | 4.82                                   | 4.56   | 4.29   | 4.15   | 4.01   | 3.86   | 3.70   | 3.54   | 3.38     |
| 21                                                | 4.70                                   | 4.44   | 4.17   | 4.03   | 3.88   | 3.74   | 3.58   | 3.42   | 3.26     |
| 22                                                | 4.58                                   | 4.33   | 4.06   | 3.92   | 3.78   | 3.63   | 3.48   | 3.32   | 3.15     |
| 23                                                | 4.48                                   | 4.23   | 3.96   | 3.82   | 3.68   | 3.53   | 3.38   | 3.22   | 3.05     |
| 24                                                | 4.39                                   | 4.14   | 3.87   | 3.74   | 3.59   | 3.45   | 3.29   | 3.14   | 2.97     |
| 25                                                | 4.31                                   | 4.06   | 3.79   | 3.66   | 3.52   | 3.37   | 3.22   | 3.06   | 2.89     |
| 26                                                | 4.24                                   | 3.99   | 3.72   | 3.59   | 3.44   | 3.30   | 3.15   | 2.99   | 2.82     |
| 27                                                | 4.17                                   | 3.92   | 3.66   | 3.52   | 3.38   | 3.23   | 3.08   | 2.92   | 2.75     |
| 28                                                | 4.11                                   | 3.86   | 3.60   | 3.46   | 3.32   | 3.18   | 3.02   | 2.86   | 2.69     |
| 29                                                | 4.05                                   | 3.80   | 3.54   | 3.41   | 3.27   | 3.12   | 2.97   | 2.81   | 2.64     |
| 30                                                | 4.00                                   | 3.75   | 3.49   | 3.36   | 3.22   | 3.07   | 2.92   | 2.76   | 2.59     |
| 40                                                | 3.64                                   | 3.40   | 3.14   | 3.01   | 2.87   | 2.73   | 2.57   | 2.41   | 2.23     |
| 60                                                | 3.32                                   | 3.08   | 2.83   | 2.69   | 2.55   | 2.41   | 2.25   | 2.08   | 1.89     |
| 120                                               | 3.02                                   | 2.78   | 2.53   | 2.40   | 2.26   | 2.11   | 1.95   | 1.77   | 1.54     |
| $\infty$                                          | 2.74                                   | 2.51   | 2.27   | 2.13   | 1.99   | 1.84   | 1.66   | 1.45   | 1.00     |

This table was generated using MINITAB.