| Name      | Rec. Instr. |
|-----------|-------------|
| Signature | Rec. Time   |

## Math 221 – Exam 1 – January 30, 2018

No books, calculators, or notes are allowed. Please make sure that your cell phone is turned off. You will have 75 minutes to complete the exam.

## SHOW YOUR WORK!

| Problem | Points | Points   | Problem     | Points | Points   |
|---------|--------|----------|-------------|--------|----------|
|         |        | Possible |             |        | Possible |
| 1       |        | 20       | 6           |        | 10       |
|         |        |          |             |        |          |
| 2       |        | 10       | 7           |        | 10       |
|         |        |          |             |        |          |
| 3       |        | 10       | 8           |        | 10       |
|         |        |          |             |        |          |
| 4       |        | 10       | 9           |        | 10       |
|         |        |          |             |        |          |
| 5       |        | 10       | Total Score |        | 100      |
|         |        |          |             |        |          |

$$\begin{split} &\sin(ax)\sin(bx) = \frac{1}{2}\cos((a-b)x) - \frac{1}{2}\cos((a+b)x) \\ &\cos(ax)\cos(bx) = \frac{1}{2}\sin((a-b)x) + \frac{1}{2}\cos((a+b)x) \\ &\sin(ax)\cos(bx) = \frac{1}{2}\sin((a-b)x) + \frac{1}{2}\sin((a+b)x) \\ &\sin^2(x) = \frac{1-\cos(2x)}{2} &\cos^2(x) = \frac{1+\cos(2x)}{2} \\ &\int \tan(x)\,dx = \ln|\sec(x)| + C &\int \sec(x)\,dx = \ln|\sec(x) + \tan(x)| + C \\ &\int \frac{dx}{\sqrt{a^2-x^2}} = \arcsin\left(\frac{x}{a}\right) + C &\int \frac{dx}{a^2+x^2} = \frac{1}{a}\arctan\left(\frac{x}{a}\right) + C \\ &\int \sin^n(x)\,dx = -\frac{\sin^{n-1}(x)\cos(x)}{n} + \frac{n-1}{n}\int \sin^{n-2}(x)\,dx \\ &\int \cos^n(x)\,dx = \frac{\cos^{n-1}(x)\sin(x)}{n} + \frac{n-1}{n}\int \cos^{n-2}(x)\,dx \\ &\int \tan^n(x)\,dx = \frac{\tan^{n-1}(x)}{n-1} - \int \tan^{n-2}(x)\,dx \\ &\int \sec^n(x)\,dx = \frac{\sec^{n-2}(x)\tan(x)}{n-1} + \frac{n-2}{n-1}\int \sec^{n-2}(x)\,dx \end{split}$$

1. Evaluate the following integrals.

**A.** (5 points) 
$$\int e^{2x} dx$$

**B.** (5 points) 
$$\int \frac{\ln(x)}{x} dx$$

C. (10 points) 
$$\int x^2 \ln(x) dx$$

**2.** (10 points) Evaluate  $\int_0^1 \frac{12x^2 + 6}{(2x^3 + 3x + 1)^2} dx.$ 

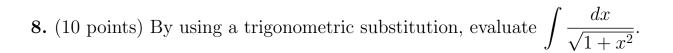
**3.** (10 points) Evaluate  $\int x\sqrt{x+5} dx$ .

**4.** (10 points) Evaluate  $\int e^x \cos(x) dx$ .

**5.** (10 points) A particle moving along a straight line has velocity  $v(t) = t^2 \cdot e^t$  ft/min after t minutes. How far does the particle travel in the first minute?

**6.** (10 points) Evaluate  $\int \tan^6(\theta) \sec^4(\theta) d\theta$ .

7. (10 points) Find the volume of the solid obtained by rotating the region bounded by  $y=3\sin(x)$ , the x-axis, and  $x=\frac{\pi}{2}$  around the x-axis.



**9.** (10 points) By using a trigonometric substitution, evaluate  $\int \sqrt{9-x^2} dx$ .