

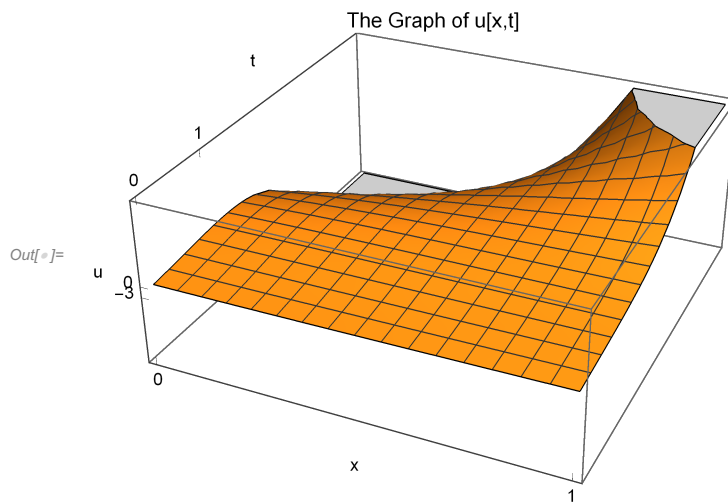
Solution of wave equation

Q .1 Find the solution of the wave equation

$$u_{tt} - u_{xx} = 0, \quad 0 < x < 1, \quad 0 \leq t \leq 4,$$

$$u(x, 0) = \text{Log}[1 + x^2], \quad 0 \leq x \leq 1, \quad u_t(x, 0) = 2, \quad 0 \leq x \leq 1.$$

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In[ ]:= a = {Derivative[0, 2][u][x, t] - Derivative[2, 0][u][x, t] == 0,  
             u[x, 0] == Log[1 + x^2], Derivative[0, 1][u][x, 0] == 2};  
b = NDSolve[a, u[x, t], {x, 0, 1}, {t, 0, 4}, PrecisionGoal -> 3]; // Quiet  
Plot3D[u[x, t] /. b, {x, 0, 1}, {t, 0, 4}, AxesLabel -> {"x", "t", "u"},  
        PlotLabel -> "The Graph of u[x,t]", Ticks -> {{0, 1, 2, 3, 4}, {0, 1}, {-3, 0}}]
```



Q .2 Find the solution of the wave equation

$$u_{tt} - u_{xx} = 0, \quad -1 < x < 1, \quad 0 \leq t \leq 4,$$

$$u(x, 0) = 1 + x, \quad -1 \leq x \leq 1, \quad u_t(x, 0) = 2, \quad -1 \leq x \leq 1.$$

```

In[ ]:= a = {Derivative[0, 2][u][x, t] - Derivative[2, 0][u][x, t] == 0,
  u[x, 0] == 1 + x, Derivative[0, 1][u][x, 0] == 0};
b = NDSolve[a, u[x, t], {x, 0, 2  $\pi$ }, {t, 0, 4}, PrecisionGoal -> 3]; // Quiet
Plot3D[u[x, t] /. b, {x, 0, 2  $\pi$ }, {t, 0, 4}, AxesLabel -> {"x", "t", "u"},
  PlotLabel -> "The Graph of u[x,t]", Ticks -> {{0, 1, 2, 3, 4}, {0, 1}, {-3, 0}}]

```

