

Name: _____

Solve the following problems.

1. Suppose that $y(x)$ solves

$$\begin{aligned}0 &= xy''(x) + y(x) - x \\ y'(0) &= -1.\end{aligned}$$

Find the degree three Taylor polynomial around zero for $y(x)$ and use this to compute an estimate to $y(.5)$.

2. Suppose that $y(x)$ solves

$$\begin{aligned}0 &= y''(x) + e^{2x} + xy(x) \\ y(0) &= 1 \quad y'(0) = 1.\end{aligned}$$

Compute the degree three Taylor polynomial of $y(x)$ around zero.

3. Suppose that $y(x)$ solves

$$\begin{aligned}0 &= y''(x) + y'(x) + e^{x^2} \\ y(0) &= 1 \quad y'(0) = 1.\end{aligned}$$

Compute the degree three Taylor polynomial of $y(x)$ around zero.

4. Suppose that $y(x)$ solves the differential equation

$$\begin{aligned}0 &= y''(x) + y(x) \\ y(0) &= 0 \quad y'(0) = 1.\end{aligned}$$

Compute the degree five Taylor polynomial of $y(x)$ around zero.