

**Homework Set 1**  
Due Friday, August 24

**I.** Do the following graphs without the aid of a calculator or computer.

- |                          |                                     |
|--------------------------|-------------------------------------|
| 1. $y = 3e^{-2x}$        | 2. $y = e^{-x} \cos x$              |
| 3. $y = \frac{1}{1+e^x}$ | 4. $y = \frac{1}{2} \sin(3x + \pi)$ |
| 5. $y = e^{2 \ln  x }$   | 6. $y = x \sin x$                   |

**II.** Read Section 5.1 in your calculus text. Do the following integrals. Take the derivative to check your answer.

- |  |                                   |  |
|--|-----------------------------------|--|
| 1. $\int \frac{1}{x+1} dx$                     | 2. $\int \frac{1}{\sqrt{x+1}} dx$ | 3. $\int_e^{e^2} \frac{1}{x \ln x} dx$ |
| 4. $\int \frac{e^x + e^{-x}}{e^x - e^{-x}} dx$ | 5. $\int x^2 e^x dx$              | 6. $\int_0^4 \frac{5}{3x+1} dx$        |

**III.** Read Section 5.3 in your calculus text. Find all functions  $y(x)$  such that ...

- |   |                               |
|---|-------------------------------|
| 1. $y' = \frac{5x}{y}$  | 2. $y' = \frac{\sqrt{x}}{2y}$ |
| 3. $y' = 3y$  | 4. $y' = x(1+y)$              |
| 5. $y' = -\frac{3}{4}\sqrt{x}$ and $y(0) = 10$  |                               |
| 6. $y' = 3y$ and $y(0) = 10$  |                               |
| 7. $y'' = g$ and $y(0) = 4$ , $y(10) = 12$ ( $g$ is a constant.)                                      |                               |
| 8. $y'' = \sin x$ and $y(0) = 1$ , $y'(0) = 7$  |                               |
| 9. If radium has a half-life of 1620 years, what percentage of a sample will be left after 500 years? |                               |
| 10. If a sample of radioactive material decays at a rate of 10% per day, what is its half-life?       |                               |

**IV.** Read about Taylor series.

1. Find the Taylor series of  $y = e^{x^2}$ , centered about  $x = 0$ . What is the radius of convergence?
2. Find the Taylor series of  $y = 1/x$  centered about  $x = 1$ . What is the radius of convergence?