

Due Monday, August 27

I. Do the following graphs without the aid of a calculator or computer. Label zeros and the y -intercept.

1. $y = 3e^{-2x}$

4. $y = \frac{1}{2} \sin(3x + \pi)$ (two cycles)

2. $y = e^{-x} \cos x$

5. $y = e^{2 \ln |x|}$

3. $y = \frac{1}{1 + e^x}$

6. $y = x \sin x$

II. Do the following integrals. Take the derivative to check your answers.

1. $\int \frac{1}{x+1} dx$

4. $\int \frac{e^x + e^{-x}}{e^x - e^{-x}} dx$

2. $\int \frac{1}{\sqrt{x+1}} dx$

5. $\int x^2 e^x dx$

3. $\int_e^{e^2} \frac{1}{x \ln x} dx$

6. $\int_0^4 \frac{5}{3x+1} dx$

III. Find all functions $y(x)$ that satisfy the following conditions.

1. $y' = 5x/y$

5. $y = \frac{3}{4}\sqrt{x}$ and $y(0) = 10$

2. $y' = \frac{\sqrt{x}}{2y}$

6. $y' = 3y$ and $y(0) = 10$

3. $y' = 3y$

7. $y'' = g$, $y(0) = 4$ and $y(10) = 12$
(g is a constant)

4. $y' = x(1+y)$

8. $y'' = \sin x$, $y(0) = 1$ and $y'(0) = 7$

IV. Answer the following.

1. If radium has a half-life of 1620 years, what percentage of a sample will be left after 500 years?

2. If a sample of radioactive material decays at a rate of 10% per day, what is its half-life?

V. Read about *Taylor series* if you need to then do the following.

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?