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

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?