

Do not forget that quizzes for *both* sections are available on the webpage <http://math.berkeley.edu/~baginski/Teaching.html>
Each section gets rather different problems.

For the following functions, perform these tasks:

- (1) Write the Maclaurin series.
- (2) Determine the radius of convergence for the Maclaurin series.

The functions:

1. $f(x) = 8$
2. $f(x) = \frac{6}{3x+4}$
3. $f(x) = \sin(\pi x^2)$
4. $f(x) = \frac{x}{8-x^3}$
5. $f(x) = \frac{\arctan(x^2)}{x}$
6. $f(x) = \sqrt{3-x}$

For the following functions $f(x)$, perform these tasks:

- (1) Write the Taylor series at $x = 2$.
- (2) Determine the 6th derivative of the function at $x = 2$.
- (3) Use the second Taylor polynomial $T_2(x)$ to estimate $f(2.5)$.
- (4) Bound the error on this estimate.

The functions:

1. $f(x) = x^3 + 4x + 1$
2. $f(x) = \sin(\pi x)$
3. $f(x) = \frac{-1}{x-3}$
4. $f(x) = (x-2)^2 e^{5x}$

Find the general solution to the following differential equations, or if initial values are given, solve the initial value problem.

1. $xy' + y = xe^{2x}$
2. $y' + xy^2 = -x, y(0) = \pi$

3. $y'' - 3y' - 4y = 5e^{-x}$

4. $y'' + y = 2\sin(x) + 4x\cos(x)$

5. $3y'' + 2y' - 5y = 0, y(0) = 1, y'(0) = 1$

6. $y'' - \frac{y'}{x} + xy = 0$

Use differential equations to model the number of bead stores in Berkeley. There are currently 7 bead stores in Berkeley.

1. If everybody in Berkeley loved beads, the number of bead stores would double every 4 years. Write and solve a differential equation that models the number of bead stores.
2. But seriously, even *Berkeley* can't sustain more than 20 bead stores. Write and solve a differential equation that models the number of bead stores that takes into account this restraint.