

## HW 15: Section 3.1

Due: Thursday, October 31st in SQRC by 9pm

**Learning Goals:**

- Find equations of tangents lines to a graph.
- Use linear approximations of a function to approximate values of the function.
- Use a linear approximation of data to approximate the value of a function.
- Use Newtons method to approximate the value of zeros of a function.

**Questions:**

1. Problem 3.1.2 Find an approximation of  $(1.2)^{\frac{1}{3}}$  by using a linear approximation to  $(1+x)^{1/3}$  at  $x = 0$ .
2. Problem 3.1.4 Find an approximation of  $2/0.99$  by using a linear approximation to  $2/x$  at  $x = 1$ .
3. Problem 3.1.8 Use a linear approximation to approximate  $\sin(0.1)$ ,  $\sin(1)$  and  $\sin(9/4)$ . Hint: Choose an approximation point  $x_0$  that is near to the value we are approximating at and so that we know  $\sin(x_0)$  exactly.
4. Problem 3.1.12 Use the table of values to approximate  $f(8)$  and  $f(12)$ :

t	5	10	15
f(t)	8	14	18
5. Problem 3.1.14 Use Newtons method starting at  $x_0 = -1$  to approximate solutions to  $x^3 + 4x^2 - x - 1 = 0$ . Compute at least the first two steps of the algorithm to find  $x_1$  and  $x_2$ .
6. Problem 3.1.20 Use Newtons method to find an approximate root of  $\cos(x) - x = 0$ . Sketch the graph and explain how you determined your initial guess.
7. Problem 3.1.28 Use Newtons method to estimate the value of  $23^{1/3}$ . Hint: Think about the equation  $x^3 = 23$ .