

## Math Lab 2: Learning About Limits and Discovering the Derivative

Due 5 pm Thu. Oct. 5 to box outside Lab 2 3255

**PART 6: FURTHER EXTENSION EXPLORATIONS ON LIMITS OF DIFFERENCE QUOTIENTS (if you have time/interest).**

**THIS IS PARTICULARLY RECOMMENDED FOR THOSE WHO FIND MUCH OF THE CURRENT WORK IS REVIEW FROM PAST CLASSES.**

Write up your results neatly, and staple to the end of the lab handout (after your Part 5 Meta-cognitive Reflection).

Use your Desmos approximate derivative calculator on the functions below to find the slope of the tangent line for various values of  $x$ . Recall that the slope of the tangent line at some point  $x$  is represented by the symbols  $f'(x)$ .

Make tables of  $x$ ,  $f(x)$ , and  $f'(x)$ . Also, make graphs of  $f(x)$  vs.  $x$  (here you can just graph the function, since it's given) and  $f'(x)$  vs.  $x$  (here you have to plot the points you find using your approximate derivative calculator).

Can you make some conclusions about the relationship between  $f(x)$  and  $f'(x)$  for each of the functions?

**Choose as many as you like and/or are interested in:**

- A.  $f(x) = \frac{1}{3}x^3$ . Try  $x = -4, -3, -2, -1, 0, 1, 2, 3, 4$ .
- B.  $f(x) = e^x$ . Try  $x = -4, -3, -2, -1, 0, 1, 2, 3, 4$ .
- C.  $f(x) = \ln x$ . Recall that  $\ln x$  is the natural log of  $x$ . Try  $x = 1, 2, 3, 4, 5$ .
- D.  $f(x) = \sin x$ . Try lots of values of  $x$  between 0 and  $2\pi$ .