Section 1.4 - Derivative as function

1. Consider the function given by $f(x) = x^3$:

a. There are actually several different ways that one typically estimates a derivative at a point using a table of values. The one that we have used so far is called the forward difference (and actually represents an average velocity, of course):

$$AV_{[a,a+h]} = \frac{f(a+h) - f(a)}{h}.$$

backward difference: $\frac{f(a)-f(a-h)}{h}$

centered difference: $\frac{f(a+h)-f(a-h)}{2h}$

Fill in the following table, wherever possible (write "NA" if a cell cannot be calculated; the last row of the table will be filled in later):

x	-2.	-1.5	-1.	-0.5	0.	0.5	1.
y=f(x)	-8.	-3.375	-1.	-0.125	0.	0.125	1.
forward							
backward							
centered							
f'(x)							

b. We can use a graph of the function to estimate the derivative function: just draw tangent lines, and estimate slopes of those tangent lines. Fill in the table below by estimating the slopes from the graph; the last row of the table will be filled in later.

$$y = x^3$$
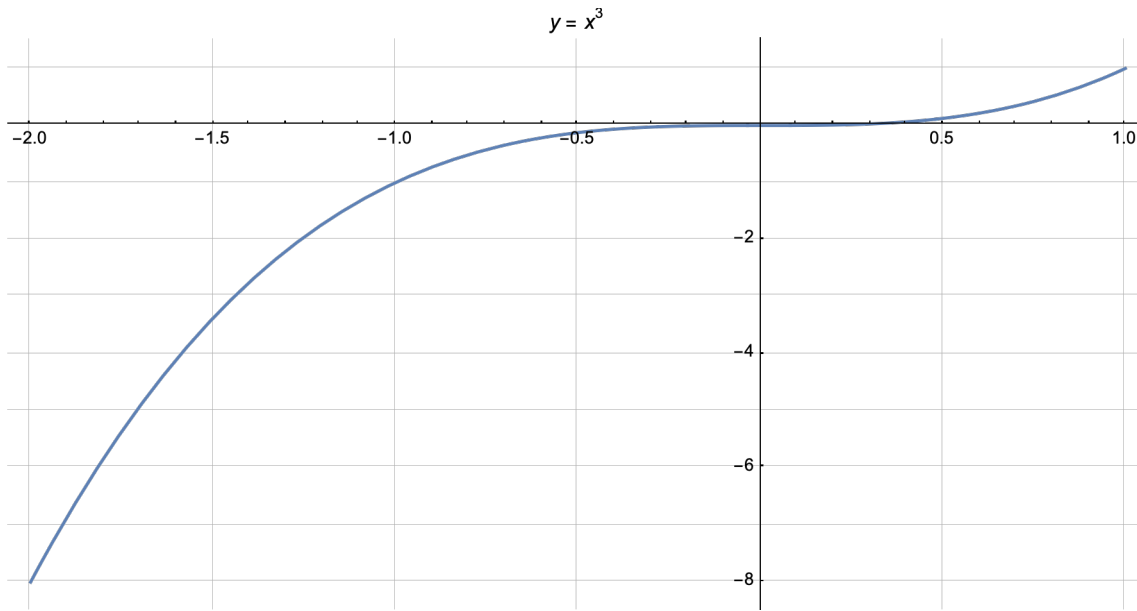
x	−2.	−1.5	−1.	−0.5	0.	0.5	1.
y=f(x)	−8.	−3.375	−1.	−0.125	0.	0.125	1.
slope							
f'(x)							

c. Finally we can use algebra to find the derivative function of f(x). Let's do so, then fill in the last lines of the tables above with the correct derivative values.
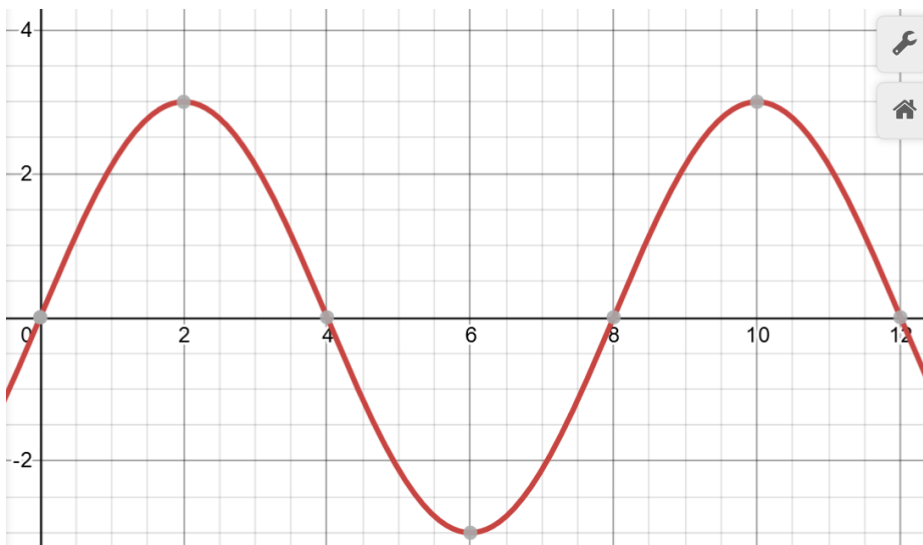
d. Which of the discrete approximations is best? How do your answers compare from your graphical estimates?

2. Given the following graph of y = f(x), draw the approximate graph of y = f'(x).
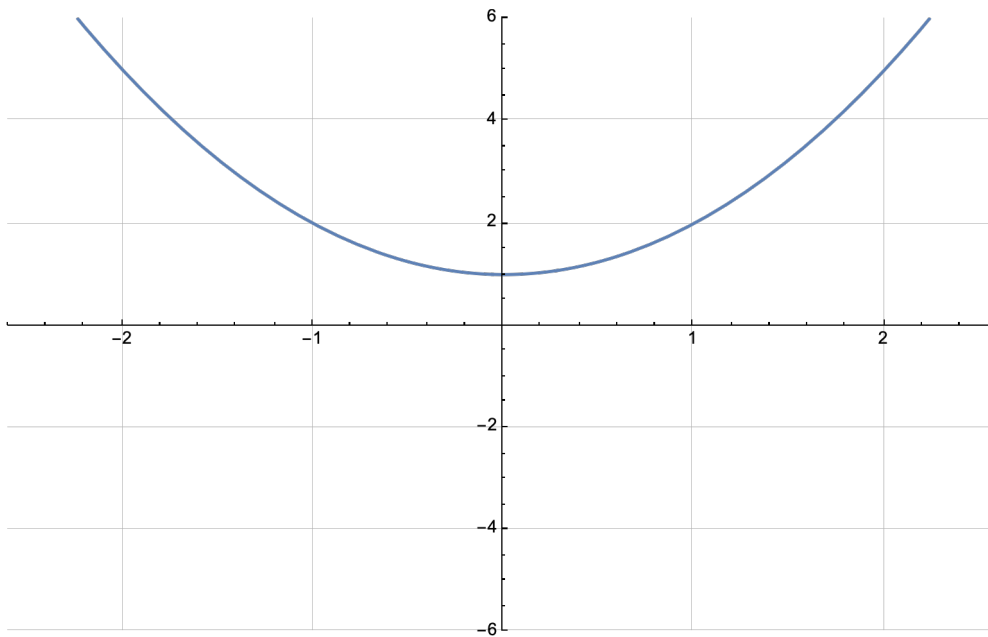
Comment on the symmetry displayed in the function f(x), and how it plays out in the derivative function.

3. Given the following graph of y = f(x), draw the approximate graph of y = f'(x).

4. Given that $y=f(x)=\frac{1}{x+1}$, use the algebraic definition to find a formula for y = f'(x). Show all of your work!

5. Given the following graph of y = f(x) draw the approximate graph of y = f'(x)