Math 19: Quiz 3 Solutions Name:

For full credit you must show your work. Partial credit may be given for incorrect solutions if sufficient work is shown.

1. Write the formula for the average rate of change (ARC) of a function f on the interval $[a, b]$. (4 pts)

   The ARC is the slope of the line that passes through $(a, f(a))$ and $(b, f(b))$.

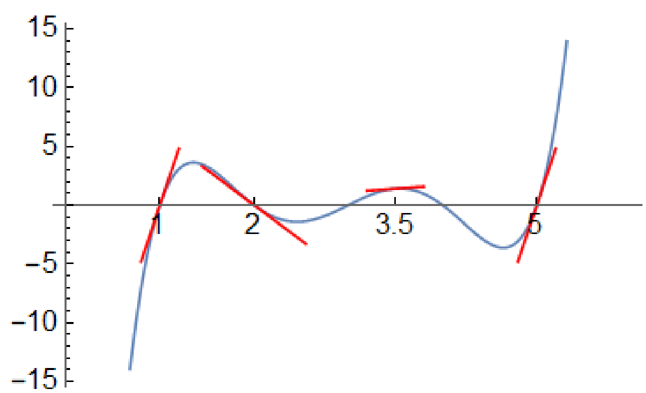
$$\text{ARC} = \frac{f(b) - f(a)}{b - a}.$$

2. Write the formula for the instantaneous rate of change (IRC) of a function f at x. (4 pts)

   The IRC is the **limit** of the ARC on the interval $[x, x + h]$ as $h \to 0$.

$$\text{IRC} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}.$$

3. Consider the function f which is graphed below.



   From the graph, determine whether the derivative is positive, negative, or approximately zero at each of the following values for x. (2 pts)

$$x = 1 \qquad x = 2 \qquad x = 3.5 \qquad x = 5.$$

   Recall that the derivative of f at x is equal to the slope of the tangent line to f at x. A segment of each tangent line is plotted in red above.

x	$f'(x)$
1.0	$+$
2.0	$-$
3.5	0
5.0	$+$

4. Bonus (1 pt): Find the equation of the line passing through the two points

$$(1, 2) \qquad \text{and} \qquad (5, 10).$$

There are several ways to determine the equation of a line. I prefer point slope form; $y - y_0 = m(x - x_0)$ where m is the slope and (x_0, y_0) is one of points on the line – I choose $(1, 2)$. We have

$$m = \frac{10 - 2}{5 - 1} = \frac{8}{4} = 2,$$

The equation of the line is

$$y - 2 = 2(x - 1)$$

which you may rearrange to

$$\boxed{y = 2x}.$$