213 Problem Set 5 Solutions

And . . . we are back to our regular schedule.

§3.2 4 This should be extremely simple, we could have done it weeks ago. They even gave us the equation. It doesn't matter which you use for x and a, but it's maybe a tiny bit easier if we use x_2 first. Just so it's here, please remember that $f(x) = -x^2 + x + 2$. So, away we go:

$$m_{\text{sec}} = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{f(1.5) - f(0.5)}{1.5 - 0.5} = \frac{[-(1.5)^2 + (1.5) + 2] - [-(0.5)^2 + 0.5 + 2]}{1.5 - 0.5} = \frac{1.25 - 2.25}{1} = -1$$

§3.2 18 Again they gave us the equation to use, that's nice for now. This one you'll need to learn. Remember that, we didn't practice it much. We'll do more today (Monday). We are given that $f(x) = \frac{-3}{x-1}$ and $a = 4$. And we set off again:

$$m_{\text{tan}} = \lim_{h\to 0} \frac{f(a+h) - f(a)}{h} = \lim_{h\to 0} \frac{f(4+h) - f(4)}{h} = \lim_{h\to 0} \frac{\frac{-3}{(3+h)} - (-1)}{h} = \lim_{h\to 0} \frac{\frac{-3}{(3+h)} + 1}{h}$$

Now for the trickiest moment here (it's not that bad), we need a common denominator. In this case it is $3 + h$. So, we proceed:

$$= \lim_{h\to 0} \frac{\frac{-3}{(3+h)} + \frac{3+h}{3+h}}{h} = \lim_{h\to 0} \frac{\frac{-3+3+h}{(3+h)}}{h} = \lim_{h\to 0} \frac{\frac{h}{(3+h)}}{h} = \lim_{h\to 0} \frac{h}{(3+h)h} = \lim_{h\to 0} \frac{1}{3+h} = \frac{1}{3}$$

That's the slope. We know $a = 4$ and $f(a) = -1$, so the equation for the line is $y - (-1) = \frac{1}{3}(x - 4)$. We can rewrite this several ways, but I don't know why you would. Here are some $y + 1 = \frac{1}{3}(x - 4)$, $y = \frac{1}{3}(x - 4) - 1$ $y = \frac{1}{3}x - \frac{7}{3}$. I like the first best.