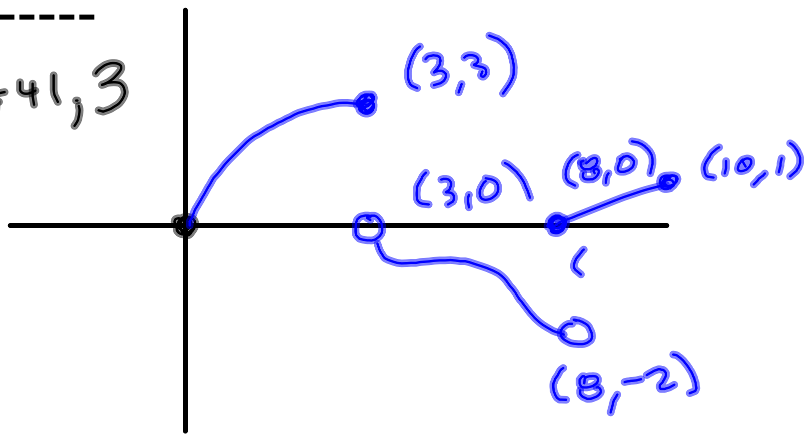
Relates to §1.8 #41, 3



$f(x)$ is cnt^s on $[0,3) \cup (3,8) \cup (8,10]$.

cnt^s from left: $x=3, 10$

cnt^s from right: $x=0, 8$

$x=0$ included and $x=10$ included in the "blanket statement" because they're endpoints of the domain.

$x=3, 8$ not continuous from both sides.

§1.8 1, 3, 4, 7, 13, 17, 19, 21, 41, 64

#12 #s 12-14 $f(x) = (x+2x^3)^4$, $a = -1$

$\mathcal{D}(f) = \mathbb{R}$,

$\boxed{\lim_{x \to -1} (x+2x^3)^4} = (-1+2(-1)^3)^4 = (-3)^4 = 81 \boxed{= f(-1)}$

props of limits let us substitute directly in, here. It's the 4th power of a polynomial. It's all good.

#s 35-38 We're supposed to know that these functions are continuous on their domains, so we can just plug in the x-value w/o any fuss.

§2.1 Slope of a curve at one point
Derivative at a point

§2.2 Slope of a curve at any point
by leaving the variable as a variable.
Derivative function

2.1 Let $f(x) = x^2$. Find the slope of the tangent to $f(x)$ at $x = 3$.

Sol'n Use limit of the slope of a secant line.

$$m_{sec} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{f(x+h) - f(x)}{h}$$

$$= \frac{f(3+h) - f(3)}{h} = \frac{(3+h)^2 - 3^2}{h} = \frac{9 + 6h + h^2 - 9}{h}$$

$$= \frac{h(6+h)}{h} = 6 + h \xrightarrow{h \to 0} 6 = m_{tan} @ x = 6.$$

for $f(x) = x^2$.

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§2.2 Find the derivative of $f(x) = x^2$.
Use it to find $f'(3)$ = slope of $f(x)$ @ $x=3$:

$$\frac{f(x+h)-f(x)}{h} = \frac{(x+h)^2 - x^2}{h} = \frac{x^2+2xh+h^2-x^2}{h}$$

$$= \frac{2xh+h^2}{h} = \frac{h(2x+h)}{h} = 2x+h \xrightarrow{h \to 0} 2x$$

So $\boxed{2x = f'(x)}$ & so $f'(3) = 2(3) = 6$

ADVANTAGE §2.2: we can find $f'(4)$, $f'(5)$, $f(-3)$ <u>FAST</u>.

Derivative as a Function.

Compare & contrast previous page.

$f'(4) = 2(4) = 8$, $f'(-3) = 2(-3) = -6$.

Derivative $= \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = f'(x)$

is the slope of f(x) @ x.

Graph f'(x) next to f(x) on same set of axes.

$f(x) = 3x + 2 \longrightarrow f'(x) = 3$

$\frac{f(x+h) - f(x)}{h} = \frac{3(x+h) + 2 - (3x+2)}{h}$

$= \frac{3x + 3h + 2 - 3x - 2}{h} = \frac{3h}{h} = 3 = m_{tan} = f'(x).$

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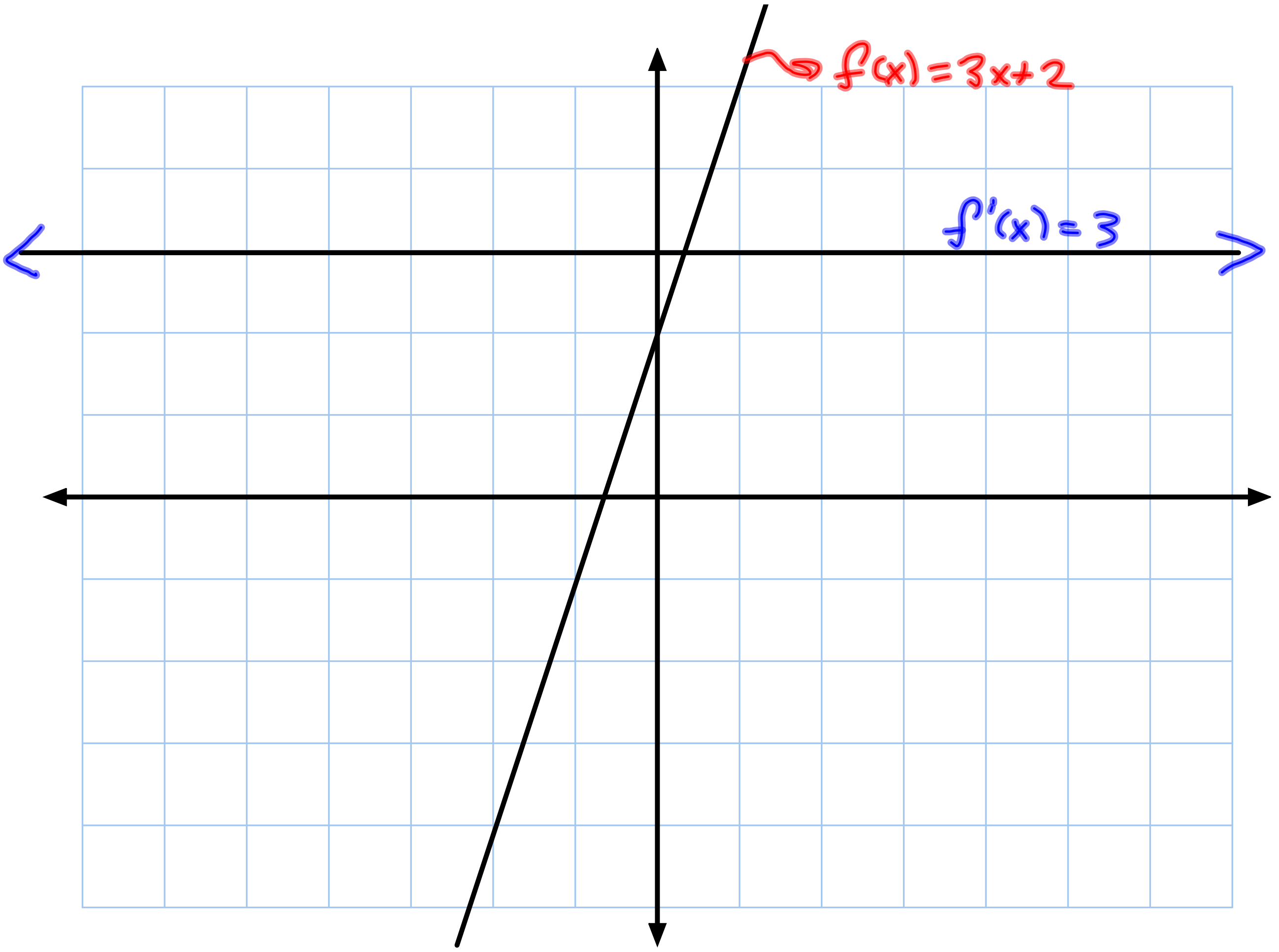

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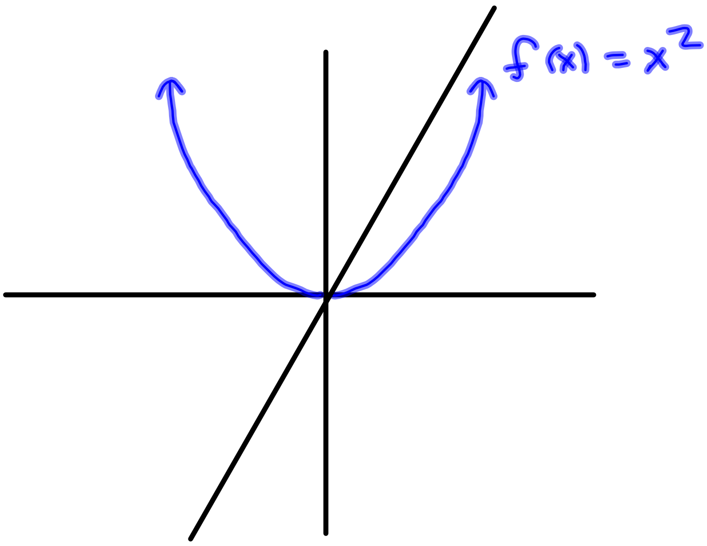
We just did $f'(x) = 2x$ for $f(x) = x^2$



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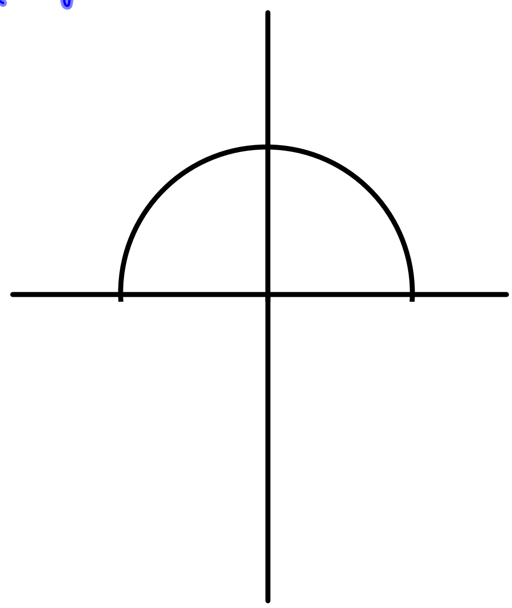
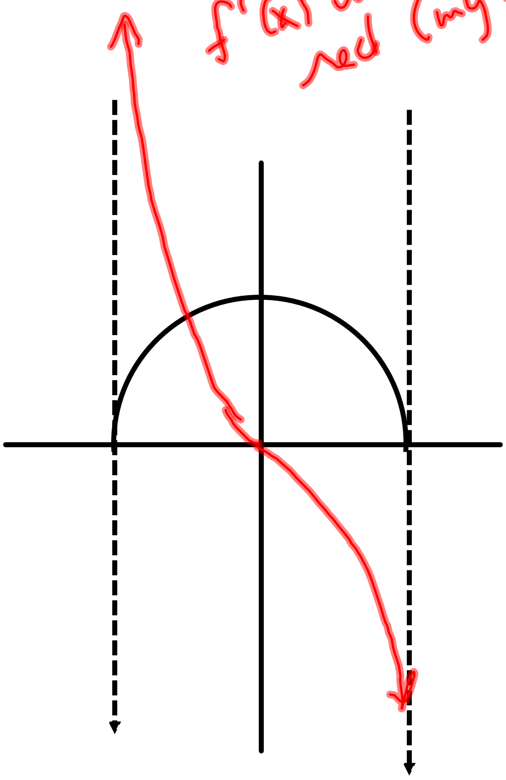
§2.2
#7
Graph of $f(x)$ is given. We graph $f'(x)$.





f'(x) is red (my shaky hand)

§2.2 #7

Graph of f(x) is given. We graph f'(x)