1. Calculate the derivative (slope of the tangent line) using the definition.

Distribute/FOIL: $$f'(3) = \lim_{h \to 0} \frac{9 + 6h + h^2 + 15 + 5h - 24}{h}$$	Step: ____
Collect like terms: $$f'(3) = \lim_{h \to 0} \frac{h^2 + 11h}{h}$$	Step: ____
Evaluate the limit: $$f'(3) = 11$$	Step: ____
Definition of the derivative at $x = 3$: $$f'(3) = \lim_{h \to 0} \frac{f(3+h) - f(3)}{h}$$	Step: ____
Factor: $$f'(3) = \lim_{h \to 0} = \frac{h(h+11)}{h}$$	Step: ____
Begin Simplifying: $$f'(3) = \lim_{h \to 0} \frac{(3+h)(3+h) + 5(3+h) - 24}{h}$$	Step: ____
Cancel: $$f'(3) = \lim_{h \to 0} h + 11$$	Step: ____
Use $f(x) = x^2 + 5x$ $$f'(3) = \lim_{h \to 0} \frac{(3+h)^2 + 5(3+h) - 24}{h}$$	Step: ____

2. $f(x) = 3x^2 - x$. Find $f'(x)$ by circling the correct next step from each row. In the third column, explain why this is the correct step and what caused the error in the incorrect step.

Step 1.	$\lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$	$\lim_{h\to -2} \frac{f(x+h) - f(x)}{h}$	
Step 2.	$\lim_{h\to 0} \frac{3(x+h)^2 - x + h + (3x^2 - x)}{h}$	$\lim_{h\to 0} \frac{3(x+h)^2 - x - h - (3x^2 - x)}{h}$	
Step 3.	$\lim_{h\to 0} \frac{3(x^2 + 2xh + h^2) - x - h - (3x^2 - x)}{h}$	$\lim_{h\to 0} \frac{3(x^2 + h^2) - x - h - (3x^2 - x)}{h}$	
Step 4.	$\lim_{h\to 0} \frac{3x^2 + 2xh + h^2 - x - h - (3x^2 - x)}{h}$	$\lim_{h\to 0} \frac{3x^2 + 6xh + 3h^2 - x - h - (3x^2 - x)}{h}$	
Step 5.	$\lim_{h\to 0} \frac{6xh + 3h^2 - h}{h}$	$\lim_{h\to 0} \frac{3h^2 + 6xh - h - 2x}{h}$	
Step 6.	$\frac{3h^2 + 6xh - h}{h}$	$\frac{h(3h + 6x - 1)}{h}$	
Step 7.	$\lim_{h\to 0} 3h + 6x - 1$	$3h + 6x - 1$	
Step 8.	$6x + 2$	$6x - 1$	

3. $f(x) = \sqrt{x}$. Find $f'(4)$ by filling in the boxes with the correct mathematical expressions.

$$f'(4) = \lim_{h \to 0} \frac{f(\Box) - f(\Box)}{h}$$

$$= \lim_{h \to 0} \Box$$

$$= \lim_{h \to 0} \frac{\sqrt{4+h} - 2}{h} \cdot \frac{\sqrt{4+h} + 2}{\sqrt{4+h} + 2}$$

$$= \lim_{h \to 0} \Box$$

$$= \lim_{h \to 0} \frac{4 + h + \Box}{h\left(\sqrt{4+h} + 2\right)}$$

$$= \lim_{h \to 0} \frac{\Box}{h\left(\sqrt{4+h} + 2\right)}$$

$$= \lim_{h \to 0} \frac{1}{\sqrt{4+h} + 2}$$

$$= \frac{1}{\sqrt{4 + \Box} + 2}$$

$$= \Box$$

4. Now you're on your own! Use the definition of the derivative to calculate the following derivatives.

(a) $f(x) = 7x^2 + 5x$. Find $f'(2)$.

(b) $f(x) = \frac{1}{x}$. Find $f'(3)$.

(c) $f(x) = \frac{2}{\sqrt{x}}$. Find $f'(4)$.

5. Now you're on your own! Use the definition of the derivative to calculate the following derivatives.

(a) $f(x) = 2x^2 + 4x$

(b) $f(x) = \dfrac{1}{x}$

(c) $f(x) = \dfrac{2}{\sqrt{x}}$