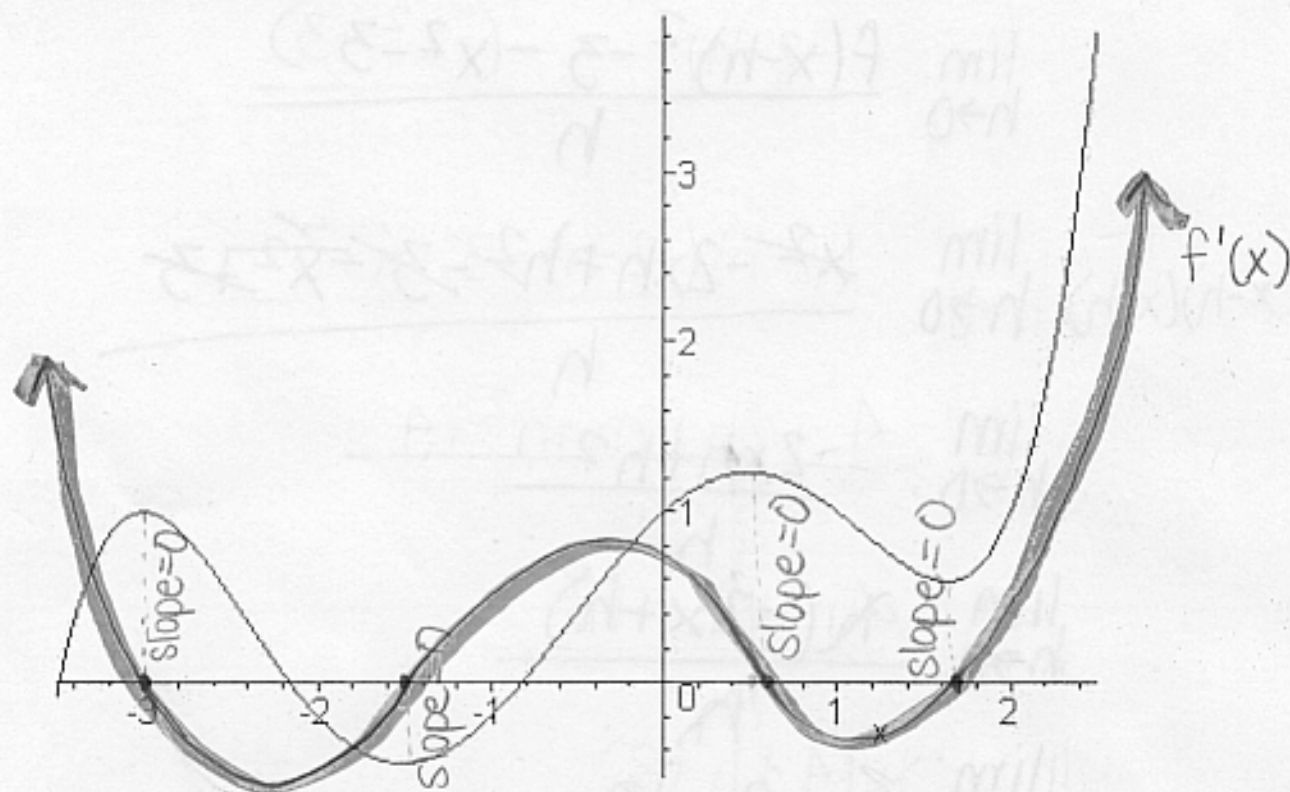Each problem is worth 5 points. For full credit indicate clearly how you reached your answer.

1. Sketch the graph of the derivative of the function shown:

2. Use the definition of the derivative to show that if $f(x) = x^2 - 3$, then $f'(-2) = -4$.

By definition of the derivative we have,

$$f'(-2) = \lim_{h \to 0} \frac{f(-2+h) - f(-2)}{h}$$

$$= \lim_{h \to 0} \frac{(-2+h)^2 - 3 - ((-2)^2 - 3)}{h}$$

$$= \lim_{h \to 0} \frac{4 - 4h + h^2 - 3 - (4 - 3)}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{4} - 4h + h^2 - \cancel{3} - \cancel{1}}{h}$$

$$= \lim_{h \to 0} \frac{h^2 - 4h}{h}$$

$$= \lim_{h \to 0} \frac{\cancel{h}(h - 4)}{\cancel{h}}$$

$$= \lim_{h \to 0} (h - 4)$$

Great Job

$$= 0 - 4$$

$$\therefore f'(-2) = -4$$