Math 1823-004 Quiz 5 Spring 2016

Name: Solution

Student Number:

Problem 1

Find the derivative of the following functions using the **definition of derivative.**
Recall: The derivative of a function $y = f(x)$ is defined by

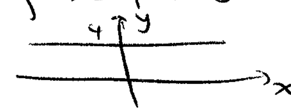
$$f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$$

(a) $f(x) = 4$

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

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

Remember: $f(x) = 4$ has a graph



$f'(x)$ = slope of tangent line
But tangent line at every pt. is the same horizontal line and so slope is 0
(horizontal line have slope 0)

(b) $f(x) = x^2$

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

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

$$= \lim_{h\to 0} \frac{\cancel{x^2} + 2xh + h^2 \cancel{- x^2}}{h}$$

$$= \lim_{h\to 0} \frac{h(2x+h)}{h} = \lim_{h\to 0} (2x+h) = 2x$$

(c) $f(x) = 1/x$

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

$$= \lim_{h\to 0} \frac{\frac{1}{x+h} - \frac{1}{x}}{h}$$

$$= \lim_{h\to 0} \frac{x - (x+h)}{h \cdot x \cdot (x+h)}$$

$$= \lim_{h\to 0} \frac{-\cancel{h}}{\cancel{h} \cdot x \cdot (x+h)} = \lim_{h\to 0} \frac{-1}{x(x+h)} = -\frac{1}{x^2}$$