Name: Richard

MATH 200 – QUIZ 5

February 12, 2015

1. Suppose $f(x) = \sqrt{3x}$. Use the limit definition of the derivative to find $f'(x)$. Please show all work.

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = \lim_{h\to 0} \frac{\sqrt{3(x+h)} - \sqrt{3x}}{h}$$

$$= \lim_{h\to 0} \frac{\sqrt{3x+3h} - \sqrt{3x}}{h} \cdot \frac{\sqrt{3x+3h} + \sqrt{3x}}{\sqrt{3x+3h} + \sqrt{3x}}$$

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

$$= \lim_{h\to 0} \frac{3}{\sqrt{3x+3h} + \sqrt{3x}} = \frac{3}{\sqrt{3x+3\cdot 0} + \sqrt{3x}} = \frac{3}{2\sqrt{3x}}$$

Therefore $\boxed{f'(x) = \frac{3}{2\sqrt{3x}}}$

Name: Richard

MATH 200 – QUIZ 5

February 12, 2015

1. Suppose $f(x) = 3x - x^2$. Use the limit definition of the derivative to find $f'(x)$. Please show all work.

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

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

$$= \lim_{h\to 0} \frac{3x+3h - x^2 - 2xh - h^2 - 3x + x^2}{h}$$

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

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

Therefore $\boxed{f'(x) = 3 - 2x}$