

Math 16A (Summer 2010)
Kouba
Quiz 3

KEY

PRINT Name : _____

Exam ID # : _____

1.) (10 pts.) Use $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ to find the derivative of $f(x) = 3x^2 - x + 1$.

$$\begin{aligned}
 f'(x) &= \lim_{h \rightarrow 0} \frac{3(x+h)^2 - (x+h) + 1 - [3x^2 - x + 1]}{h} \\
 &= \lim_{h \rightarrow 0} \frac{3(x^2 + 2hx + h^2) - x - h + 1 - 3x^2 + x - 1}{h} \\
 &= \lim_{h \rightarrow 0} \frac{\cancel{3x^2} + 6hx + 3h^2 - \cancel{x} - h + \cancel{1} - \cancel{3x^2} + \cancel{x} - \cancel{1}}{h} \\
 &= \lim_{h \rightarrow 0} \frac{\cancel{h} (6x + 3h - 1)}{\cancel{h}} = 6x - 1
 \end{aligned}$$

2.) (5 pts. each) Use shortcut rules to find the derivatives of each function.

a.) $y = (1/2)x - 3$
 $\text{D} \rightarrow y' = 1/2$

b.) $f(x) = x^{-3} + x^2 - 8x^{1/4}$
 $\text{D} \rightarrow f'(x) = -3x^{-4} + 2x - 8 \cdot \frac{1}{4} x^{-3/4}$

c.) $y = \frac{x^3 - x}{x - 3}$
 $\text{D} \rightarrow y' = \frac{(x-3)(3x^2 - 1) - (x^3 - x)(1)}{(x-3)^2}$

d.) $g(x) = (2-x)(3x+7)(4-\sqrt{x})$
 $\text{D} \rightarrow g'(x) = (-1)(3x+7)(4-\sqrt{x}) + (2-x)(3)(4-\sqrt{x}) + (2-x)(3x+7)(-\frac{1}{2}x^{-1/2})$

3.) (6 pts.) Find an equation of the line tangent to the graph of $f(x) = \frac{x^2}{2-x}$ at the point $x=3$.

$$\frac{D}{\rightarrow} f'(x) = \frac{(2-x)(2x) - x^2(-1)}{(2-x)^2} \quad \text{and } x=3$$

so SLOPE $m = f'(3) = \frac{-6+9}{1} = 3$ and $x=3, y=-9$ so line is

$$y - (-9) = 3(x - 3) \rightarrow y = 3x - 18$$

4.) (7 pts. each) Use the graph of f to draw a rough sketch of the graph of its derivative f' .

