Math 105 Quiz 3
§2.1-§2.2, 9/28/12
Name:

Show all work for credit. As discussed in class, please re-write any negative or fractional exponents appropriately.

1. Find the derivative of $f(x) = \sqrt{3x-2}$ using the limit definition of the derivative.

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

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

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

2. Use the sum/difference, constant multiple, and power rules to evaluate the following.

(a) $(2\sqrt[3]{x} - e + \frac{1}{3x^4} - x + x^{3/5})'$

This is equivalent to $(2x^{1/3} - e + \frac{1}{3}x^{-4} - x + x^{3/5})' = \frac{2}{3}x^{-2/3} - 0 - \frac{4}{3}x^{-5} - 1 + \frac{3}{5}x^{-2/5}$.

Re-written: The derivative is $\frac{2}{3\sqrt[3]{x^2}} - \frac{4}{3x^5} - 1 + \frac{3}{5\sqrt[5]{x^2}}$.

(b)

$$\frac{d}{dx}\left(\frac{x(2x+3)}{x^{\frac{1}{2}}}\right)$$

This is equivalent to $\frac{d}{dx}(x^{1/2}(2x+3)) = \frac{d}{dx}(2x^{3/2} + 3x^{1/2})$

$= 3x^{1/2} + \frac{3}{2}x^{-1/2} = 3\sqrt{x} + \frac{3}{2\sqrt{x}}$

3. Find the equation of the tangent line at $x = 4$ on the function $f(x) = \frac{x(2x+3)}{x^{\frac{1}{2}}}$

$f(4) = \frac{4(11)}{2} = 22$

$f'(4) = 3 * 2 + \frac{3}{4} = 6\frac{3}{4}$

So, the tangent line through $x = 4$ is $y - 22 = 6\frac{3}{4}(x-4)$