

Math 181
Name:
February 15, 2008

QUIZ # 5

Find the derivatives of the following functions

1. (3 points) $f(x) = \frac{1}{3x} + 3\sqrt{x}$

Solution: $f'(x) = -\frac{1}{3x^2} + \frac{3}{2}x^{-1/2}$

2. (3 points) $f(x) = (x^4 + 2x)(\sin x)^2$

Solution: $f'(x) = (4x^3 + 2)(\sin x)^2 + 2(x^4 + 2x)\sin x \cos x$ by the method we discussed in class $(f^2)' = 2ff'$.

3. (4 points) $f(x) = \frac{5x - 4}{3x^2 + 1}$

Solution: $f'(x) = \frac{5(3x^2 + 1) - (5x - 4)(6x)}{(3x^2 + 1)^2} = \frac{-15x^2 + 24x + 5}{(3x^2 + 1)^2}$.

Solve the following two problem **completely**.

4. (5 points) Suppose $g(t) = \frac{t + 2}{t + 3}$.

(a) What is $g'(t)$?

Solution: $g = \frac{t + 3 - 1}{t + 3} = 1 - \frac{1}{t + 3}$ so that $g' = \frac{1}{(t + 3)^2}$.

(b) What is $g'(1)$?

Solution: $g'(1) = \frac{1}{(1 + 3)^2} = \frac{1}{16}$.

(c) What is the equation of the tangent line of $y = g(t)$ at $t = 1$?

Solution: By the point-slope formula,

$$y - g(1) = m(t - 1) \Rightarrow y = g'(1)(t - 1) + g(1) \Rightarrow y = \frac{1}{16}t + \frac{11}{16}.$$

5. (5 points) Find all points on the graph of $y = x^3 - x^2 + 3$ where the tangent line is horizontal.

Solution: The slope for tangent line is $m = y' = 3x^2 - 2x$, so that

$$0 = m = 3x^2 - 2x \Rightarrow x = 0, \text{ and } x = \frac{2}{3}.$$