Math 203: HW 3 (redo)

Due on Wednesday, June 12th

Summer '13

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Problem 1

Graph the following functions and **give the domain and range**:

$$f(x) = \begin{cases} 2 & : \quad x < -1 \\ x^2 + 1 & : -1 \leq x \leq 1 \\ 2 & : \quad x \geq 1 \end{cases}$$

$$g(x) = \begin{cases} -2 & : \quad x < -1 \\ \frac{2}{x} & : -1 \leq x \leq 1 \\ 2 & : \quad x \geq 1 \end{cases}$$

Problem 2

Compute the following limits:

$$\lim_{x \to 3} 5x + 1$$

$$\lim_{x \to 6} \frac{\sqrt{x-2} - 2}{x - 6}$$

$$\lim_{x \to 1} \frac{x^2 - 4}{x - 2}$$

Problem 3

Use the **limit definition** to find the derivative, $f'(x)$ for the following functions:

$$f(x) = 5x + 3$$

$$f(x) = x^2 - 7$$

$$f(x) = \frac{5}{x^2}$$

Problem 4

Use the **formula found in class** to differentiate the following:

$$f(s) = s^{\pi+1} + 7s + 1$$

$$g(t) = 2\sqrt{t} + 4t$$

$$h(x) = \frac{6}{x^{1/4}} + 3x^2 + 2x$$

$$i(t) = t^{2.1} + t^8 + (\frac{2}{\sqrt{t}})^7$$

Problem 5

Use the **Product Rule** to differentiate the following:

$$m(x) = (x^3 + 3x^3 + 2x)(x^{12} + x^3 + 7x)$$
$$n(x) = \sin(3x)x^{10}$$

Problem 6

Express the following functions as the composition of two functions:

$$w(x) = \sin(x^3 + 3x^2 + 10x)$$
$$h(x) = \sqrt[5]{x^2 + 10x + 3}$$
$$r(x) = \cos(\sin(\sin(x)))$$

Now, use the **Chain Rule** to take the derivative of each.

Problem 7

Use **Quotient Rule** to take the derivative of the following:

$$l(x) = \frac{\cos(x)}{x^3}$$
$$k(x) = \frac{x^2 + 10x}{x^4 + x^3 + x^2}$$
$$m(x) = \frac{\sin(2x)x^2}{x^2 + x}$$
$$p(x) = \frac{\cos(2x)}{x^2 + 3x^5}$$

Problem 8

Differentiate the following:

$$y = (7x^2 - 1)(3x^2 + 1)^4$$
$$y = x^3(x^5 - 1)^3$$
$$y = \frac{\sqrt{2x}}{\sqrt{x} + x}$$

Problem 9

Let $p(t) = -t^2 + 9t$ be the function that gives the position of ball when thrown straight up (this is not the equation for planet Earth). Remember that instantaneous velocity, or instantaneous speed, is the same as the slope of the graph at that point. How fast did we through the ball? (hint: this is the speed at $t = 0$) What is special about the velocity of the ball when it is at it's maximum height? Ask math for what time, t, this happens, then plug that t into p(t), this will be the maximum height of our ball. Explain what $p'(3)$ means. What is the ball's maximum height?