

# Math 241 Makeup and Practice

Due Nov 6, 2014

**Instructions.** Open book and open notes and you can look at your midterm. You can also use webwork. But you need to do this on your own without consulting any other sources including the web other than webwork. **Show your work!**

(18) 1. Find the derivative of each of the following functions.

a.  $f(x) = (2x^3 - 5x)(5x + 2)^8(x^3 + x + 3)^6$

b.  $g(x) = \frac{x}{2x^2 + 3x + 1}$

c.  $h(t) = \sec((1 - 5t)^4 + t^5)$

(20)     **2.** Find the following limits. Show your work.

**a.**  $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x^3 - 8}$

**b.**  $\lim_{x \rightarrow 0} \frac{\sin(5x)}{x}$

**c.**  $\lim_{x \rightarrow \infty} \frac{\sqrt{1 + 4x^2}}{4 + 7x}$

**d.**  $\lim_{t \rightarrow 0} \left( \frac{1}{t\sqrt{1+t}} - \frac{1}{t} \right)$  **Hint:** first make this into a single fraction.

- (10)    **3.** Gravel is being dumped from a conveyor belt at a rate of 50 cubic feet per minute. It forms a pile in the shape of a right circular cone whose base diameter and height are always the same. How fast is the height of the pile increasing when the pile is 17 feet high? Recall that the volume of a right circular cone with height  $h$  and radius of the base  $r$  is given by  $V = \frac{1}{3}\pi r^2 h$ .

- (10)    **4.** Find the absolute minimum and maximum of  $f(x) = x^3 - 12x + 5$  on the closed interval  $[-5, 3]$ . Give both the  $x$  and  $y$  values for these extrema.

(20)    **5.** Let  $f(x) = x^4 - 8x^2 + 16$ .

**a.** Find all local and absolute minima and maxima. Give both the  $x$  and  $y$  coordinates of each.

**b.** Find the intervals where  $f$  is increasing and decreasing.

**c.** Find the intervals where  $f$  is concave up and where it is concave down.

**d.** Find the inflection points.

- (10)    **6.** A rectangle has one side on the  $x$ -axis and two vertices on the curve

$$\frac{3}{2+x^2}$$

Find the vertices of the rectangle with maximum area. (I'll do a similar problem in class.)