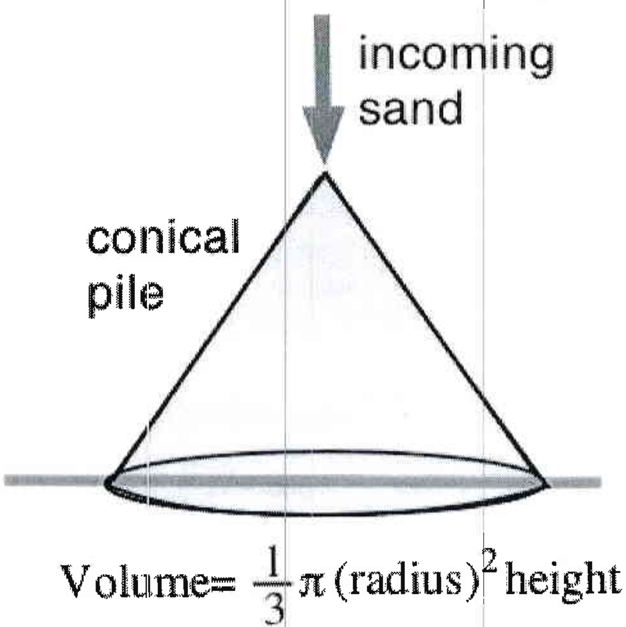
Math 1151, Quiz #8, Fall 2014 Name KEY

Instructions: Show all work. Answers without work may only receive partial credit. If you are asked for an explanation, explain as completely as possible. Use exact answers unless specifically asked to round.

1. Sand falls from an overhead bin and accumulates in a conical pile with a radius that is always three times its height. Suppose the height of the pile increases at a rate of 2 cm/s when the pile is 12 cm high. At what rate is the sand leaving the bin at that instant?



$r = 3h$

$\dot{h} = 2\text{cm/s}$

$h = 12\text{ cm}$

$V = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi (3h)^2 h =$

$V = 3\pi h^3$

$\dot{V} = 9\pi h^2 \cdot \dot{h}$

$\dot{V} = 9\pi (12)^2 \cdot 2$

$2592\pi\ \text{cm}^3/\text{s}$

2. Find any critical points of the function $f(x) = \frac{4}{5}x^5 - 3x^3 + 5$ on the interval $[-2,2]$. Use that information to find the absolute maximum and minimum on that interval.

$f'(x) = 4x^4 - 9x^2 = 0$

$x^2(4x^2 - 9) = 0$

$x = 0 \quad x = \pm\frac{3}{2}$

$f(-2) = 3.4$

$f(-3/2) = 9.05$ ABS MAX

$f(0) = 5$

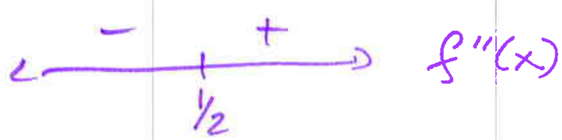
$f(3/2) = .95$ ABS MIN

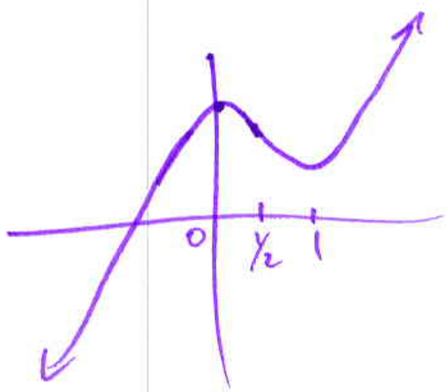
$f(2) = 6.6$

3. Find all critical points and inflection points of the graph $f(x) = 2x^3 - 3x^2 + 12$. Use the second derivative test to determine whether each critical point is the location of a maximum or a minimum. Be sure to include sign charts for both the first and second derivatives.

$f'(x) = 6x^2 - 6x = 0 \qquad 6x(x-1) = 0 \qquad x=0,\ x=1$

$f''(x) = 12x - 6 \qquad 12x = 6 \Rightarrow x = 1/2$





$f(0)$ is a maximum

$f(1)$ is a minimum