Math 108 **Name** (print) KEY
Quiz 6 **Spring 2005**

Work carefully and neatly. You must show all relevant work! You may receive no credit if there is insufficient work. NO GRAPHING CALCULATORS!

[3pts] 1. Differentiate the function $f(x) = \sqrt{5x^4 - 12}$.

Use the chain rule: $f(x) = (5x^4 - 12)^{1/2}$. So
$f'(x) = (1/2)(5x^4 - 12)^{-1/2}(20x^3) = 10x^3(5x^4 - 12)^{-1/2}$ or $f'(x) = \dfrac{10x^3}{\sqrt{5x^4 - 12}}$.

I would accept either of the last two answers.

[3pts] 2. Find the equation of the tangent line to the graph of $(2x^2 - 1)^6$ when $x = 1$.

$f'(x) = 6(2x^2 - 1)^5(4x)$. Then $f'(1) = 6(1)^5 \cdot 4 = 24$. Thus we want the line with slope $m = 24$ and through the point $(1, f(1))$. But $f(1) = (2 - 1)^6 = 1$. So the equation is

$$y - 1 = 24(x - 1) \text{ which becomes } y = 24x - 23$$

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[4pts] 3. According to a study workers at a factory will have assembled $f(x) = -x^3 + 6x^2 + 15x$ radios x hours after arriving on the job at 8:00 am. Use calculus to estimate how many radios will be assembled between 9:00 and 9:15 am.

What is being asked is "what is the change in total production in the specified time period?"

Recall that at 9:00 am $x = 1$. So I am asking for the change as x goes from 1 to 5/4. Hence $x_0 = 1$ and $\Delta x = 1/4$. Thus $\Delta y \approx f'(x_0)\Delta x = f'(1)(1/4)$.

Then $f'(x) = -3x^2 + 12x + 15$. Hence $f'(1) = -3 + 12 + 15 = 24$. So $f'(1)(1/4) = 24 \cdot (1/4) = 6$. Therefore approximately 6 radios are manufactured in the specified time period.