**Math 108**                                           **Name** (print) KEY
**Quiz 5**                                              **Spring 2006**

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

[4pts] 1. The distance a particle moving along a straight line has at time $t$ from a fixed position is $s(t) = t^3 - 9t^2 + 15t + 25$ for $0 \le t \le 6$. Determine when the particle is stationary.

It is stationary when its velocity is zero. Its velocity is
$v(t) = s'(t) = 3t^2 - 18t + 15$. Set this equal to zero.
$$3t^2 - 18t + 15 = 0,$$
Then divide by 3 to get
$$t^2 - 6t + 5 = 0$$
Then factor to get
$$(t-1)(t-5) = 0$$
So $t = 1$ or $t = 5$. Since both numbers are on the interval $0 \le t \le 6$, $t = 1$ or $t = 5$ is the final answer.

[6pts] 2. Find the derivative of the following (perform any elementary simplifications).

(a) $f(x) = \dfrac{2x^2 - 5}{x + 7}$, Use the quotient rule:
$$f'(x)\frac{(x+7)(4x) - (1)(2x^2 - 5))}{(x+7)^2}$$
$$= \frac{4x^2 + 28x - 2x^2 + 5}{(x+7)^2}$$
$$= \frac{2x^2 + 28x + 5}{(x+7)^2}$$

(b) $f(x) = \sqrt{3x^4 - 7x} = (x^3 - 2)(x^3 + \sqrt{x})$. Use the product rule.

Rewrite as $f(x) = (x^3 - 2)(x^3 + x^{1/2})$. Then
$$f'(x) = 3x^2(x^3 + x^{1/2}) + (x^3 - 2)(3x^2 + (1/2)x^{-1/2})$$
I would accept the above. Or continue as below:
$$= 3x^5 + 3x^{5/2} + 3x^5 + (1/2)x^{5/2} - 6x^2 - x^{-1/2}$$
$$= 6x^5 + \frac{7}{2}x^{5/2} - 6x^2 - x^{-1/2}$$