231 Quiz 6

March 17, 2011 **Name** * key *

By printing my name I pledge to uphold the Honor Code.

Work individually. You may use your Notebooks but no loose papers, printouts, photocopies, books, calculators, cell phones, or other resources.

1. For each function or implicit function $y = y(x)$, find $\frac{dy}{dx}$.

a) $y = (x\sqrt{3x+1})^{-3}$

* don't simplify

5 pts

$$\frac{dy}{dx} = -3\left(x\sqrt{3x+1}\right)^{-4}\left(1\cdot\sqrt{3x+1} + x\left(\tfrac{1}{2}\right)(3x+1)^{-1/2}(3)\right).$$

product

chain

chain rule

b) $x^2 + xy^3 = 2$

* don't solve for y first

5 pts

$$2x + 1\cdot y^3 + x\cdot 3y^2\frac{dy}{dx} = 0$$

$$\frac{dy}{dx} = \frac{-2x - y^3}{3xy^2}.$$

2. Suppose that a spaceship taking off from Earth's orbit is moving at velocity $v(t) = 0.014t^2 + 300$ thousands of miles per hour.

a) Find a formula for the acceleration $a(t)$ of the spaceship. What are the units of $a(t)$?

5 pts

$a(t) = v'(t) = 0.028t$, in thous. of miles per hour per hour

b) Find a formula for the position $s(t)$ of the spaceship, given that its initial position is $s_0 = 0$ thousands of miles from Earth's orbit. What are the units of $s(t)$?

5 pts

$s'(t) = v(t) = 0.014t^2 + 300$

so $s(t) = \frac{0.014}{3}t^3 + 300t + \underbrace{s_0}_{0}$, in thousands of miles