Math1210 Quiz 8 (2.7, 2.8) Summer, 2009 Dylan Zwick

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Instructions: Please show all of your work as partial credit will be given where appropriate, **and** there may be no credit given for problems where there is no work shown. All answers should be completely simplified, unless otherwise stated. (Calculator necessary.)

Note – There are problems on both sides of the page.

1. (8 points) Find $\frac{dy}{dx}$ for $4y^3 - 3\sqrt{xy} = x^2 + 5$

   (You need to at least get $\frac{dy}{dx}$ by itself, but don't simplify past that.)

$$\frac{d}{dx}\left(4y^3 - 3\sqrt{xy}\right) = \frac{d}{dx}\left(x^2+5\right)$$

$$\Rightarrow 12y^2\left(\frac{dy}{dx}\right) - \frac{3}{2}\sqrt{\frac{x}{y}}\left(\frac{dy}{dx}\right) - \frac{3}{2}\sqrt{\frac{y}{x}} = 2x$$

$$\Rightarrow \frac{dy}{dx} = \frac{2x + \frac{3}{2}\sqrt{\frac{y}{x}}}{12y^2 - \frac{3}{2}\sqrt{\frac{x}{y}}}$$

Answer 1: $\boxed{\frac{dy}{dx} = \frac{2x + \frac{3}{2}\sqrt{\frac{y}{x}}}{12y^2 - \frac{3}{2}\sqrt{\frac{x}{y}}}}$

(Note: #2 is on the back side!!!)

2. (7 points) The area of an equilateral triangle is decreasing at a rate of 2 square centimeters per second. Find the rate at which the length of a side is changing when the area of the triangle is $100\sqrt{3}$ square centimeters. (*Hint*: Area of an equilateral triangle is given by $A=\frac{\sqrt{3}}{4}x^2$ where x is the side length.)

$$A = \frac{\sqrt{3}}{4}x^2$$

$$\frac{dA}{dt} = \frac{\sqrt{3}}{2} \times \left(\frac{dx}{dt}\right) \qquad \frac{dA}{dt} = 2\ cm^2/s$$

$$x = \sqrt{\frac{4A}{\sqrt{3}}} = \sqrt{\frac{4(100\sqrt{3}\ cm^2)}{\sqrt{3}}} = 20\,cm$$

$$\Rightarrow \quad \frac{dx}{dt} = \frac{2\ cm^2/s}{\frac{\sqrt{3}}{2}(20\,cm)} = \boxed{\frac{1}{5\sqrt{3}}\ cm/s}$$

Answer 2: $\boxed{\frac{1}{5\sqrt{3}}\ cm/s}$