MAT265 Quiz 9/28/23 **KEY** **Name:**

Show work, be neat. Submit to the Canvas site by midnight tonight, one page PDF. Original work only. Beware, sites like wolfram, desmos, etc, show things in unique ways and we'll know if you used it.

1. Find $\frac{dy}{dx}$ given the implicit relation $2x^4y^3 + 4x^2 = 5y + 11$.

[5 pts]

$$(2x^4)\left(3y^2\frac{dy}{dx}\right) + (y^3)(8x^3) + 8x = 5\frac{dy}{dx}$$

$$6x^4y^2\frac{dy}{dx} - 5\frac{dy}{dx} = -8x - 8x^3y^3$$

$$\frac{dy}{dx}(6x^4y^2 - 5) = -8x - 8x^3y^3$$

$$\frac{dy}{dx} = \frac{-8x - 8x^3y^3}{6x^4y^2 - 5}$$

Also acceptable:

$$\frac{dy}{dx} = \frac{8x + 8x^3y^3}{-6x^4y^2 + 5}$$

2. A cylindrical storage tank measures 8 feet tall with a base radius of 2 feet. The volume of a cylinder of base radius r and height h is $V = \pi r^2 h$. Using differentials, find the change in volume, $\frac{dV}{dt}$, if the heat is causing the height of the cylinder to expand by 0.05 ft/hr and the radius to expand by 0.03 ft/hr.

[5pts]

Implicitly differentiate using product rule: (3 pts)

$$\frac{dV}{dt} = (\pi r^2)\left(\frac{dh}{dt}\right) + (h)\left(2\pi r\frac{dr}{dt}\right)$$

Evaluate: (2 pts)

$$\frac{dV}{dt} = \pi(2)^2(0.05) + 2\pi(2)(8)(0.03) = 0.2\pi + 0.96\pi = 1.16\pi \approx 3.64\ \text{in}^3/\text{hr}$$