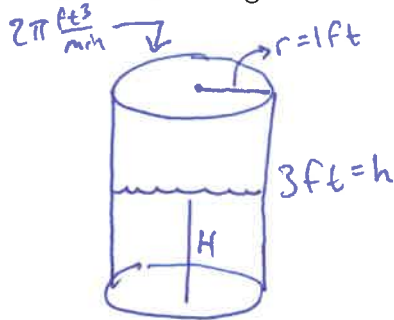


Instructions: Show all work and simplify your answers! Correct answers without work will receive zero points. Also, points will be taken from messy solutions. **Good Luck!** ☺

1. A cylindrical tank has height 3ft and radius 1ft. Hot Koolaid flows in at a rate of $2\pi \text{ft}^3/\text{min}$. How fast is the water level rising when it is 2ft high?



$$\text{Volume of cylinder} = \pi r^2 h$$

$$H = \text{Koolaid level}$$

$$\text{Volume of Koolaid} = 2\pi t \quad (t \text{ in minutes})$$

$$\text{Height of Koolaid} = H = \frac{2\pi t}{\pi r^2} = \frac{2\pi t}{\pi} = 2t$$

$$\text{Rate of change of height of Koolaid} = H' = 2 \text{ ft/min}$$

\Rightarrow Water level is rising at a rate of 2 ft/min when $H = 2 \text{ ft}$

2. What is the derivative of $7^{\ln(x^2+1)}$?

$$(\ln 7) 7^{\ln(x^2+1)} \left(\frac{2x}{x^2+1} \right) = \frac{2x 7^{\ln(x^2+1)} \ln 7}{x^2+1}$$

3. If $2x^2 - y^2 = 6y - 2x + 4$, find $\frac{dy}{dx}$.

$$\Rightarrow 4x - 2yy' = 6y' - 2$$

$$\Rightarrow 2x - yy' = 3y' - 1$$

$$\Rightarrow 2x + 1 = (3 + y)y'$$

$$\Rightarrow y' = \frac{dy}{dx} = \frac{2x+1}{3+y}$$