Please show **all** your work! Answers without supporting work will not be given credit. Write answers in spaces provided.

Once you are done, scan or take a picture of this document and submit it via email to fernan87@purdue.edu

Name:

1. Use implicit differentiation the following expressions.

(a) [**1 pt**] $\dfrac{d}{dx}(xy)$

Solution: Note this is just a variation of the product rule.

$$
\begin{aligned}
\frac{d}{dx}(xy) &= \frac{d}{dx}(x) \cdot y + x \cdot \frac{d}{dx}(y) \\
&= \frac{dx}{dx} \cdot y + x \cdot \frac{dy}{dx} \\
&= 1 \cdot y + x \cdot \frac{dy}{dx} \\
&= y + x \cdot \frac{dy}{dx}
\end{aligned}
$$

(b) [**1 pt**] $\dfrac{d}{dx}\left(\dfrac{x}{y}\right)$

Solution: Note this is just a variation of the quotient rule.

$$
\begin{aligned}
\frac{d}{dx}\left(\frac{x}{y}\right) &= \frac{\dfrac{d}{dx}(x) \cdot y - x \cdot \dfrac{d}{dx}(y)}{y^2} \\
&= \frac{\dfrac{dx}{dx} \cdot y - x \cdot \dfrac{dy}{dx}}{y^2} \\
&= \frac{1 \cdot y - x \cdot \dfrac{dy}{dx}}{y^2} \\
&= \frac{y - x \cdot \dfrac{dy}{dx}}{y^2} \\
&= \frac{y}{y^2} - \frac{x}{y^2} \cdot \frac{dy}{dx} \\
&= \frac{1}{y} - \frac{x}{y^2} \cdot \frac{dy}{dx}
\end{aligned}
$$