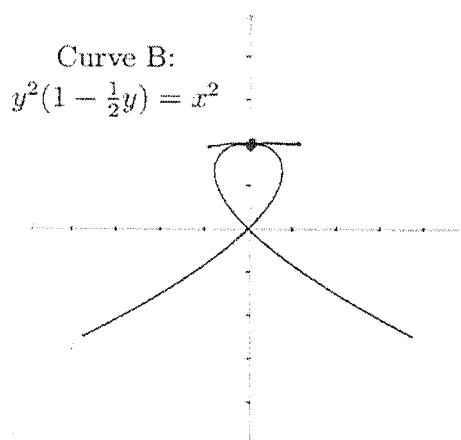
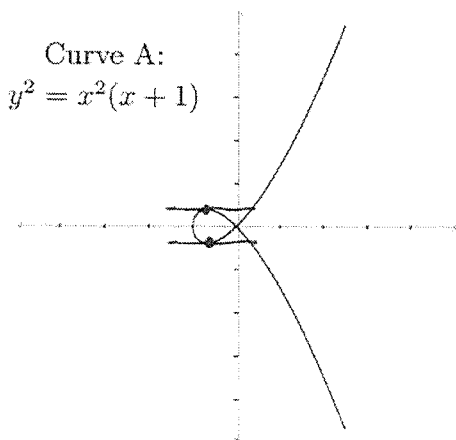


In this worksheet, we'll practice implicit differentiation with the curves below.



1. Looking at the graph, how many points are there on Curve A that have a horizontal tangent line? What about Curve B?

Curve A: 2

Curve B: 1

2. Use implicit differentiation to find the points on Curve A with a horizontal tangent line. $\Rightarrow \frac{dy}{dx} = 0$

$$\textcircled{1} \frac{d}{dx}(y^2) = \frac{d}{dx}(x^2(x+1)) = \frac{d}{dx}(x^3 + x^2)$$

$$2yy' = 3x^2 + 2x$$

$$\textcircled{2} y' = \frac{3x^2 + 2x}{2y}$$

$$\textcircled{3} \text{ set } y' = 0:$$

$$0 = \frac{3x^2 + 2x}{2y}$$

y cannot be zero!

$$\Rightarrow 0 = x(3x+2)$$

$$x = 0, -2/3 \Rightarrow (0,0) \text{ and } (-2/3, \pm \sqrt{4/27})$$

3. Use implicit differentiation to find the points on Curve B with a horizontal tangent line.

$$\frac{d}{dx}(y^2 - \frac{1}{2}y^3) = \frac{d}{dx}(x^2)$$

$$2yy' - \frac{3}{2}y^2 \cdot y' = 2x$$

$$y' = \frac{2x}{2y - \frac{3}{2}y^2}$$

$$\text{set } y' = 0$$

$$\Rightarrow 0 = \frac{2x}{2y - \frac{3}{2}y^2}$$

y cannot be zero!!

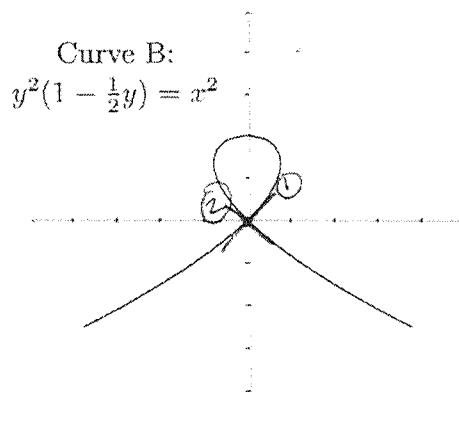
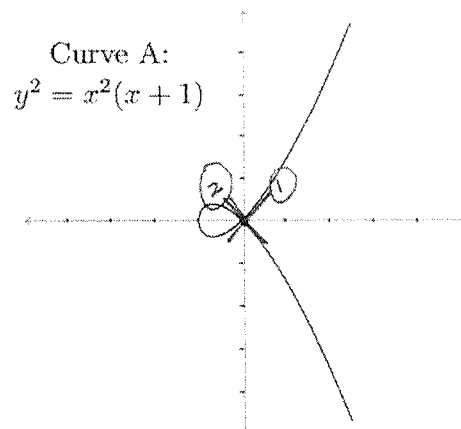
$$x = 0$$

$$\Rightarrow (0, 2) \text{ (point w/ horizontal tangent line)}$$

Curve B (w/ $x=0$):

$$0 = y^2(1 - \frac{1}{2}y) \Rightarrow y=0, y=2$$

points w/ horizontal tangent line



4. How many lines are tangent to Curve A at the point $(0,0)$? What about Curve B?

Curve A: 2 Curve B: 2

5. Try to find $\frac{dy}{dx}$ at the point $(0,0)$ on both graphs. What goes wrong?

You get 0 in the denominator of $\frac{dy}{dx}!!$