



Name Key
 Hour _____ Date _____

Halloween Activity Calculus

Work each problem. Then write the answers as an ordered pair (a, b) and follow the instructions for graphing on the sheet provided.

Right Eye

(3, 3)

1. a. What is the value at which there is a vertical asymptote of

$$f(x) = \frac{x^2 + 5x + 6}{x^2 - 9} \quad \frac{(x+2)(x+3)}{(x+3)(x-3)} \quad x=3$$

- b. At what value is there a removable discontinuity in $x=3$

$$f(x) = \frac{x^2 - 10x + 21}{x^2 + 2x - 15} \quad \frac{(x-7)(x-3)}{(x+5)(x-3)}$$

(7, 5)

2. a. $f(x) = 3x^3 - 5x^2 - 2x + 7$

$$f(2) = 3(2)^3 - 5(2)^2 - 2(2) + 7 = 24 - 20 - 4 + 7 = 7$$

- b. Find $\lim_{x \rightarrow \infty} \frac{5x+1}{x+2} = \frac{5}{1}$

(2, 8)

3. a. Evaluate: $\sqrt[3]{128} = 2$

- b. Solve: $\frac{x}{2} = 4 \quad x = 8$

Plot the points from #1, 2, 3, and connect the points.

Left Eye

(2, 3)

4. a. What is the instantaneous rate of

change of $y = 3x^2 + 10x$ when $x = -2$?

$$y' = 6x + 10 = 6(-2) + 10 = -2$$

- b. Find $\frac{d^2y}{dx^2}$ when $x = 1$

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

$$y' = x^2 + x + 1$$

$$y'' = 2x + 1$$

$$2(1) + 1 = 3$$

(-3, 7)

5. a. Find $\frac{dy}{dx}$ when $x = -2$

$$y = x^2 + x + 1$$

$$y' = 2x + 1 = 2(-2) + 1 = -3$$

- b. Find the average rate of change

of $y = x^3 + 1$ on the interval $[-1, -2]$.

$$\frac{(-1)^3 + 1 - ((-2)^3 + 1)}{-1 - (-2)} = \frac{-1 + 1 - (-8 + 1)}{-1 + 2} = \frac{-7 - 0}{1} = -7$$

$$(-1, 0) \quad (-2, -7)$$

(-7, 4)

6. a. What is the leading coefficient of

$$y = -7x^3 + 3x^2 - x + 4 \quad -7$$

- b. Solve: $\frac{2}{3}x = 6 \cdot \frac{2}{3}$

$$x = 4$$

$$\frac{-7 - 0}{-1 - 1} = \frac{-7}{-2} = \frac{7}{2}$$

Plot the points from #4, 5, 6, and connect the points.

Nose

7. (a) What is the derivative of $y^2 = x$

where $y = \frac{1}{2}$?

b. Evaluate: $4 \cos^2 \frac{\pi}{4} = 4 \cdot \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{2}}{2} = 2$

8. (a) Find the slope of $x^2 + y^2 = 25$

at $(3, -4)$ and multiply it by $-\frac{8}{3}$.

b. Evaluate: $\sin \frac{\pi}{2} = 1$

9. a. What is the slope of a horizontal line? $m = 0$

b. What is the slope of a line perpendicular to $x - 2y = 7$?

Plot the points from #7, 8, 9, and connect the points.

Mouth

10. (a) Find the derivative of $x^2y + xy^2 = 6$

at $(1, 2)$. Answer: $y' = \frac{8}{7}$

(b) What is the opposite of the

slope of $x^2y^2 = 9$ at $(-1, 3)$?

11. a. Find the derivative of $y = (2x^2 - 1)^3$

when $x = 1$ and divide your answer by -4 .

b. Evaluate: $-\sqrt[3]{216} = -6$

12. a. Evaluate: $\frac{3 + \frac{1}{2}}{\frac{5}{8}} = \frac{5.8}{4.5} = \frac{11.6}{4.5}$

b. Solve: $-5 - 3x = 5x + 51$

13. a. Find the derivative of $y = -x \sin x$ when $x = \pi$; round your answer to the nearest whole number.

$-1 \cdot \sin x - x \cdot \cos x = -1 \cdot \sin \pi - \pi \cdot \cos \pi$

(b) Find the derivative of $y = e^{-2x}$. What is the coefficient of your answer? -2

Plot the points from #10, 11, 12, 13, and connect the points in order.

10a) $x^2y + xy^2 = 6$

$2x \cdot y + x^2 \cdot \frac{dy}{dx} + 1 \cdot y^2 + x \cdot 2y \cdot \frac{dy}{dx} = 0$

$\frac{dy}{dx}(x^2 + 2xy) = -2xy - y^2$
 $\frac{dy}{dx} = \frac{-2xy - y^2}{x^2 + 2xy} = \frac{-2(1)(2) - 2^2}{1 + 4} = \frac{-8}{5} = -\frac{8}{5}$

10b) $x^2 \cdot y \cdot \frac{dy}{dx} + 2xy^2 = 0$

$\frac{dy}{dx} = \frac{-2xy^2}{x^2y} = -\frac{2y}{x}$

$\frac{dy}{dx} = \frac{2(1)(9)}{1^2} = \frac{18}{1} = 18$

$2y \cdot \frac{dy}{dx} = 1$
 $\frac{dy}{dx} = \frac{1}{2y} = \frac{1}{2 \cdot \frac{1}{2}} = 1$

$2x + 2y \cdot \frac{dy}{dx} = 0$
 $\frac{dy}{dx} = \frac{-2x}{2y} = \frac{-6}{-8} = \frac{3}{4}$

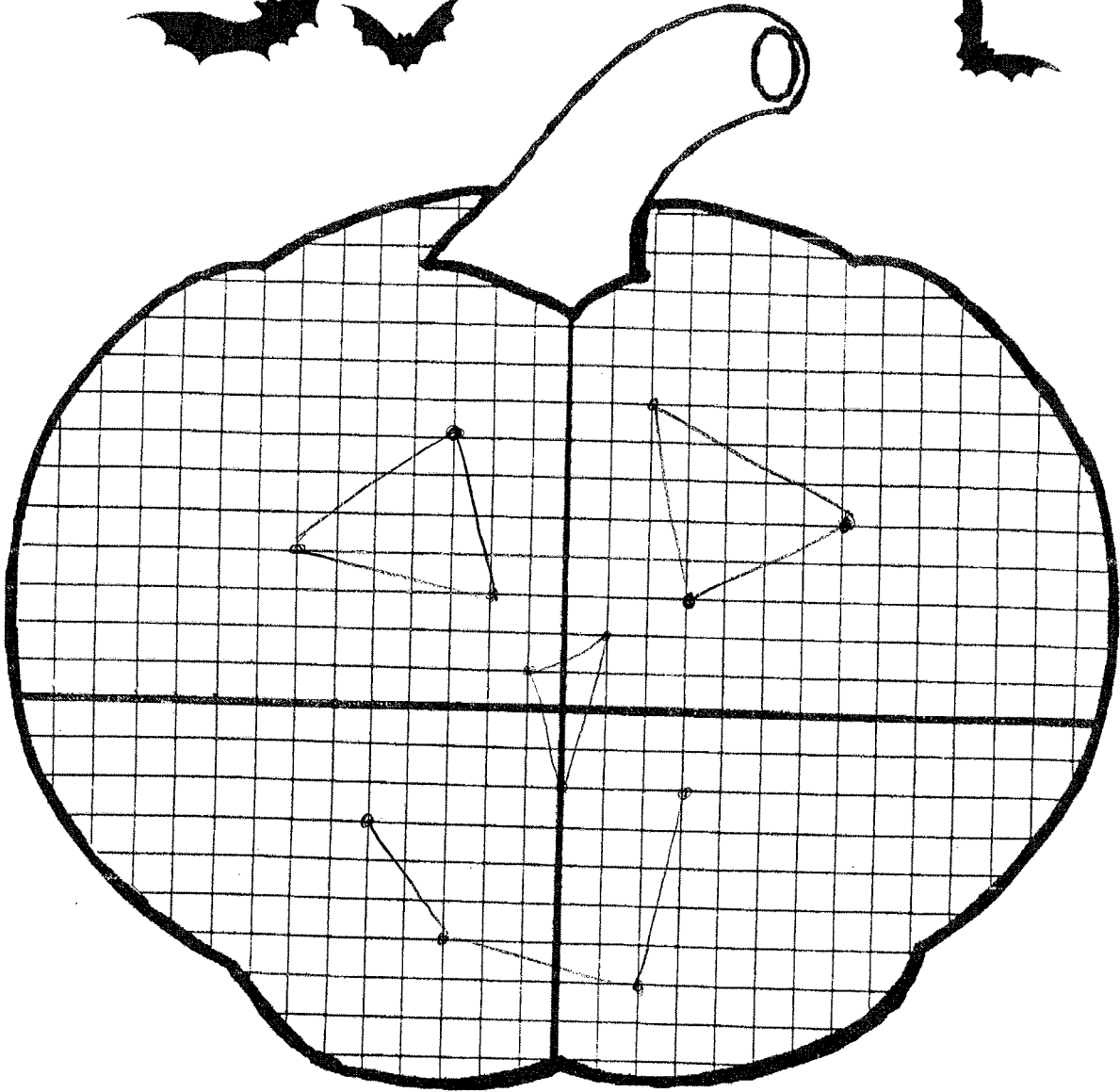
$-2y = -x + 7$
 $y = \frac{1}{2}x - \frac{7}{2}$

$y = e^x$
 $y' = e^x$

$\frac{dy}{dx} = e^{-2x} \cdot (-2) = -2e^{-2x}$

$= 0 + 18 = 18$

Happy



Halloween!

Name _____

Hour _____