

Math 4 Honors
Lesson 7-1 Quiz Prep

Name _____
Date _____

NO CALCULATOR

Station 1

Differentiate each function below. Leave your answers in a tastefully simplified form.

1. $y = e^{5x-3} \cdot x^4$

Write your answer in factored form.

$$y' = (e^{5x-3})(5)(x^4) + 4x^3(e^{5x-3})$$

$$= x^3 \cdot e^{5x-3} (5x+4)$$

2. $f(x) = \frac{x^2}{\sqrt{2x+1}}$

Write your answer as a single fraction in radical form.

$$f'(x) = \frac{2x(2x+1)^{-1/2} - \frac{1}{2}(2x+1)^{-3/2} \cdot 2 \cdot x^2}{2x+1}$$

$$= \frac{-2x(2x+1)^{-1/2} - (2x+1)^{-1/2} \cdot x^2}{2x+1}$$

$$= \frac{x(2x+1)^{-1/2} [2(2x+1) - x]}{2x+1}$$

$$= \frac{x(3x+2)}{\sqrt{(2x+1)^3}}$$

3. $y = \sqrt[3]{8^x + 5\pi} = (8^x + 5\pi)^{1/3}$

$$y' = \frac{1}{3} (8^x + 5\pi)^{-2/3} \cdot 8^x \ln 8$$

$$= \frac{1}{3} \cdot 8^x \cdot \ln 8 (8^x + 5\pi)^{-2/3}$$

Station 2

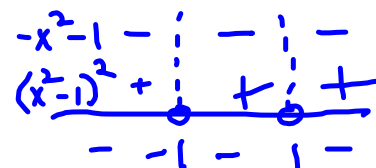
Use the function below to answer the following.

$$f(x) = \frac{x}{x^2 - 1}$$

- a. For what values of x is f increasing? Use interval notation.
For what values of x is f decreasing? Use interval notation.

$$f'(x) = \frac{x^2 - 1 - 2x \cdot x}{(x^2 - 1)^2}$$

$$= \frac{x^2 - 1 - 2x^2}{(x^2 - 1)^2}$$

$$= \frac{-x^2 - 1}{(x^2 - 1)^2}$$


Increasing :

Decreasing: $(-\infty, -1) \cup (1, \infty)$
 $\cup (-1, 1)$

- b. Identify any extrema.

None

OVER →

Station 3

1. If $v(t) = \ln(t^2 + t + 1)$, then $a(1) = \underline{\hspace{2cm}}$.

A.) $1/3$ B.) $-2/3$ C.) 1 D.) $4/3$ E.) 3

$$v'(t) = a(t) = \frac{1}{t^2 + t + 1} \cdot (2t + 1)$$

$$v'(1) = \frac{1}{1^2 + 1 + 1} \cdot (2 \cdot 1 + 1) = \frac{3}{3}$$

2. $f(x) = \frac{1}{2}(2x+5)^3$. $f'(x) = \underline{\hspace{2cm}}$.

A.) $\frac{3}{2}(2x+5)^2$ B.) $3(2x+5)^2$ C.) $3(2x+5)$ D.) $\frac{3}{2}(2x+5)$ E.) $6(2x+5)$

$$f'(x) = 3\left(\frac{1}{2}\right)(2x+5)^2(2)$$

3. Find y'' for $y = x \ln x - 3x$.

A.) $\frac{1}{x} - 3$ B.) $1 + \ln x$ C.) $\ln x - 2$ D.) $\frac{1}{x}$ E.) $\frac{1}{x} - 2$

$$y' = \ln x + x \cdot \frac{1}{x} - 3 = \ln x + 1 - 3 = \ln x - 2$$

$$y'' = \frac{1}{x} - 0 = \frac{1}{x}$$

Station 4

Given $f''(x) = \frac{2x^3 - 6x}{(x^2 + 1)^3}$.

- a. For what values of x is f concave up? *Use interval notation.*
 For what values of x is f concave down? *Use interval notation.*

$$2x^3 - 6x = 0$$

$$2x(x^2 - 3) = 0$$

$$x = 0 \quad x = \pm\sqrt{3}$$

$2x$	-		-		+		+	
$x^2 - 3$	+		-		-		+	
$(x^2 + 1)^3$	+		+		+		+	
	-	-	$\sqrt{3}$	+	0	-	$\sqrt{3}$	+

Up: $(-\sqrt{3}, 0) \cup (\sqrt{3}, \infty)$

Down:

$(-\infty, -\sqrt{3}) \cup (0, \sqrt{3})$

- b. List the x -values for the point(s) of inflection

$$x = \pm\sqrt{3}, 0$$