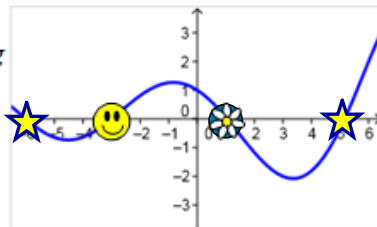Math 4 Honors   Name _____
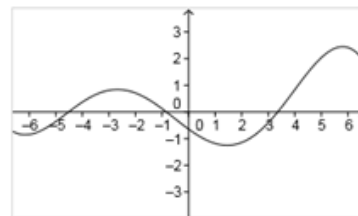
Unit 6 Test Prep   Date _____

Station 1

The function on the **left** is $f'(x)$. Which graph on the **right** is a possible graph of $f(x)$?
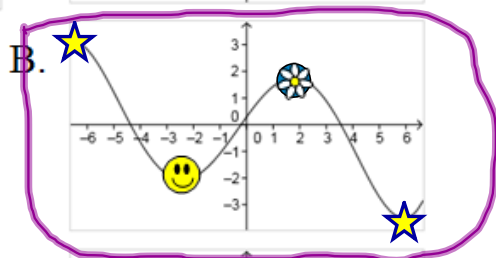
In complete sentences, explain your choice using concepts and vocabulary from Unit 7.
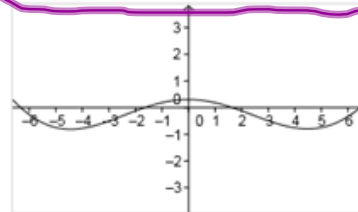
A.

B.

C.

FYI: There is a link for more practice on my teacher website.

Station 2

Use the function below to answer the following. *(Show algebraic work to support your answers)*

$$f(x) = 3x^4 - 8x^2 + 50$$

a. Calculate $f'(-1)$. $f'(x) = 12x^3 - 16x$

$$f'(-1) = 12(-1)^3 - 16(-1)$$
$$= -12 + 16 = 4$$

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

$$f''(x) = 36x^2 - 16$$
$$0 = 36x^2 - 16$$
$$0 = 4(9x^2 - 4)$$
$$0 = 4(3x - 2)(3x + 2)$$
$$x = \frac{2}{3} \qquad x = -\frac{2}{3}$$

Up: $\left(-\infty, -\frac{2}{3}\right) \cup \left(\frac{2}{3}, \infty\right)$

Down: $\left(-\frac{2}{3}, \frac{2}{3}\right)$

	4				
$3x - 2$	$-$	$+$	$+$	$+$	
$3x + 2$	$-$	$-$	$+$	$+$	
	$+$	$-\frac{2}{3}$	$-$	$\frac{2}{3}$	$+$

Station 3

1. The relative minimum of $f(x) = 2x^3 - 2.5x^2 - 4x + 2$ on the interval $[-1, 2]$ is at $x =$ _____.

   A.) -1   B.) -1/2   C.) 4/3   D.) 5/3   E.) 2

   $f'(x) = 6x^2 - 5x - 4$

   $0 = (3x-4)(2x + 1)$

   $x = 4/3 \quad x = -1/2$

   $\dfrac{3x-4}{2x+1} = \dfrac{-}{-} \quad \dfrac{-}{+} \quad \dfrac{+}{+}$

   $+ \quad -1/2 \quad 4/3 \quad +$

2. What is the slope of the tangent line for the function $f(x) = -2x^2 + 3x + 500$ when $x = -6$?

   A.) -21   B.) -4   C.) 0   D.) 27   E.) 527

   $f'(x) = -4x + 3$

   $f'(-6) = -4(-6) + 3 = 27$

3. A particle moves along a horizontal line and its position at time t is $s = t^4 - 6t^3 + 12t^2 + 3$. The velocity, v, is increasing when

   A.) $t > 1$ B.) $1 < t < 2$ C.) $t < 2$ D.) $t < 0$ or $t > 2$ E.) $t > 0$
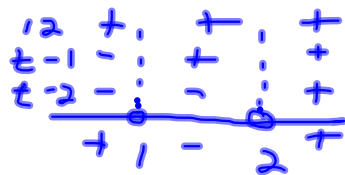
   $s' = 4t^3 - 18t^2 + 24t$

   $s'' = 12t^2 - 36t + 24$
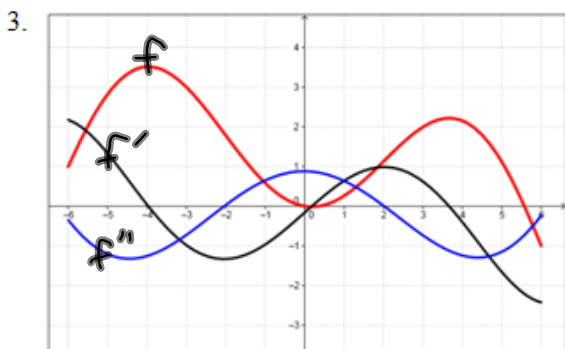
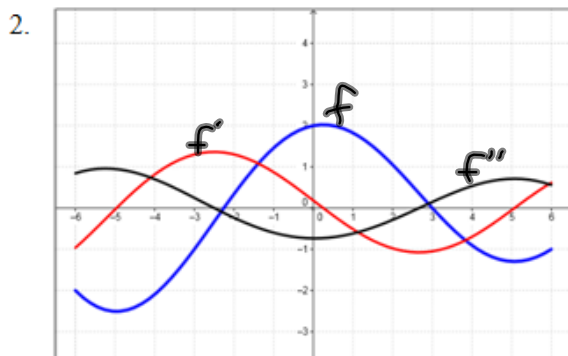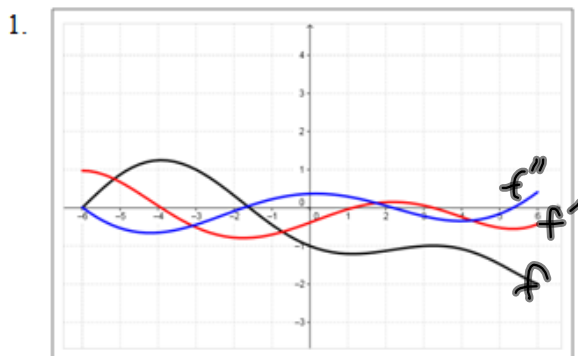 $0 = 12t^2 - 36t + 24$

   $= 12(t^2 - 3t + 2)$

   $= 12(t-1)(t-2)$

   $t = 1 \qquad t = 2$

   $\begin{array}{cccc} 12 & + & + & + \\ t-1 & - & + & + \\ t-2 & - & - & + \\ \hline & + & - & + \\ & 1 & & 2 \end{array}$

Station 4

Identify the Function, First and Second Derivatives.

1.

f″

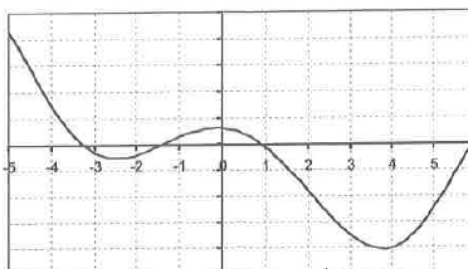f′

f

2.

f′

f

f″

3.

f

f′

f″

FYI: There is a link for more practice
on my teacher website.

Station 5

$$f'(x)$$

A graph of $f'(x)$ is given at the right.

1. On what interval(s) is $f(x)$ increasing?
    Decreasing? Explain.

+   —   +   —   +
    ⊖   ⊖   ⊖   ⊖
   -3.2   -1.5   1   6
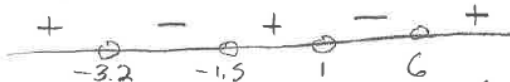
Increasing: $(-\infty, 3.2) \cup (-1.5, 1) \cup (6, \infty)$
Decreasing: $(-3.2, -1.5) \cup (1, 6)$ ⟶ Derivative negative

⟶ Derivative positive

2. On what interval(s) is $f'(x)$ increasing?
    Decreasing? Explain.

↓   ↑   ↓   ↑
   ⊕   ⊕   ⊖
  2.5   -.1   3.9

Increasing: $(-2.5, -.1) \cup (3.9, \infty)$
    [f' uphill]

Decreasing: $(-\infty, -2.5) \cup (-.1, 3.9)$
    [f' downhill]

3. On what interval(s) is $f(x)$ concave up? Concave down? Explain.

    . Same as #2! Why? . . . .

Station 6

Heml 2016
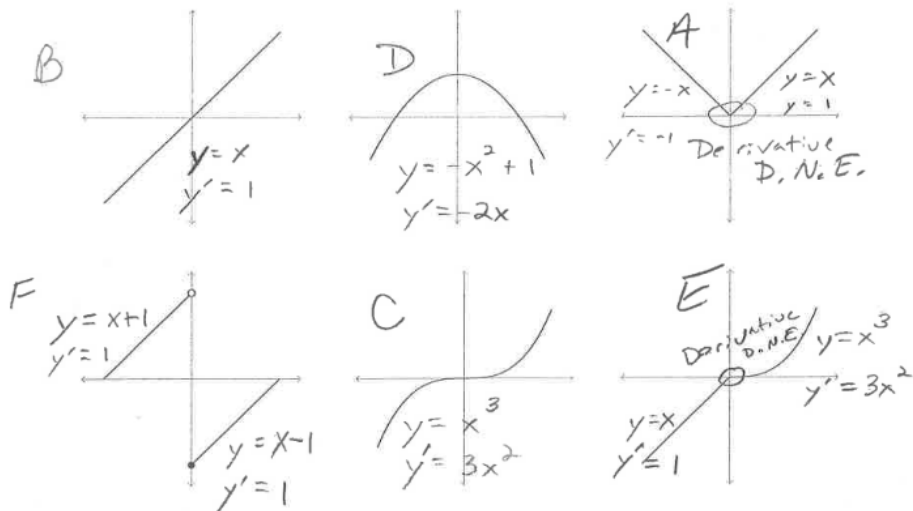
Worksheet   Math 124   Week 3

3. Six graphs of functions are below, along with six graphs of derivatives. Match the graph of each function with the graph of its derivative.

Original Functions:

B
$y = x$
$y' = 1$

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

A
$y = -x$ $y = x$
           $y = 1$
$y' = -1$ Derivative
           D, N, E.

F
$y = x+1$
$y' = 1$
$y = x-1$
$y' = 1$

C
$y = x^3$
$y' = 3x^2$

E
Derivative
D, N, E
$y = x$ $y = x^3$
$y' = 1$ $y' = 3x^2$

Their derivatives:

A

B

C

D

E

F