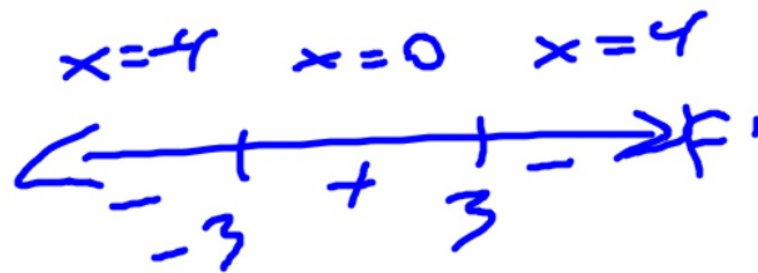


Use analytic methods to find those values of x for which the given function is increasing and those values of x for which it is decreasing.

6) $f(x) = 27x - x^3$

$$f'(x) = 27 - 3x^2 = 0 \quad x = \pm 3 \quad 6) \underline{\hspace{2cm}}$$
$$x^2 = 9$$



Increasing:
 $(-3, 3)$

Decreasing:
 $(-\infty, -3) \cup (3, \infty)$

7) $f(x) = 9x^2 + 18x + 5$

$F(x) = 3x^3 + 9x^2 + 5x + C$

Find the function with the given derivative whose graph passes through the point P.

8) $f(x) = x^2 + 9$ P(3, 55)

$f(x) = \frac{1}{3}x^3 + 9x + C$

$55 = \frac{1}{3}(3)^3 + 9(3) + C$

$55 = \frac{1}{3}(27) + 27 + C$
 $9 + 27 + C$

$55 = \cancel{27} + C$
 $55 = 36 + C$

$C = 19$

$F(x) = 3x^3 + 9x^2 + 5x + 19$

7) _____

8) _____

Sketch a graph of a function $y = f(x)$ that has the given properties.

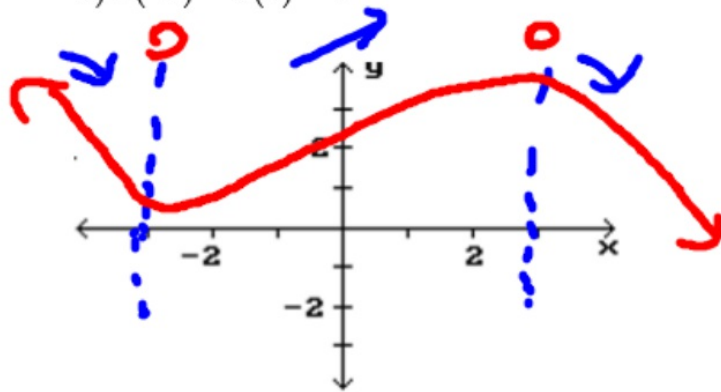
9) a) Continuous and differentiable for all real numbers

b) $f'(x) < 0$ on $(-\infty, -3)$ and $(3, \infty)$

c) $f'(x) > 0$ on $(-3, 3)$

d) $f'(-3) = f'(3) = 0$

← extremas?



Use the Concavity Test to find the intervals where the graph of the function is concave up.

11) $y = 3x^2 + 18x + 4$

⑪ $y' = -6x + 18$

$y'' = -6$

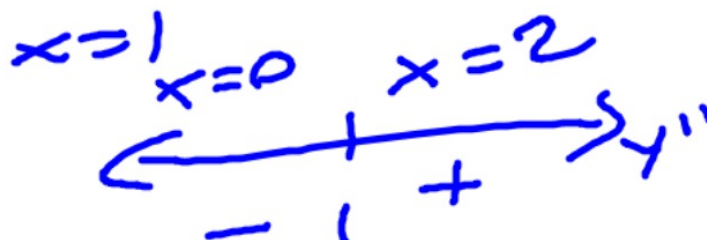
11) None

Find the points of inflection.

12) $y = x^3 - 3x^2 + 2x + 15$

⑫ $y' = 3x^2 - 6x + 2$
 $y'' = 6x - 6 = 0$

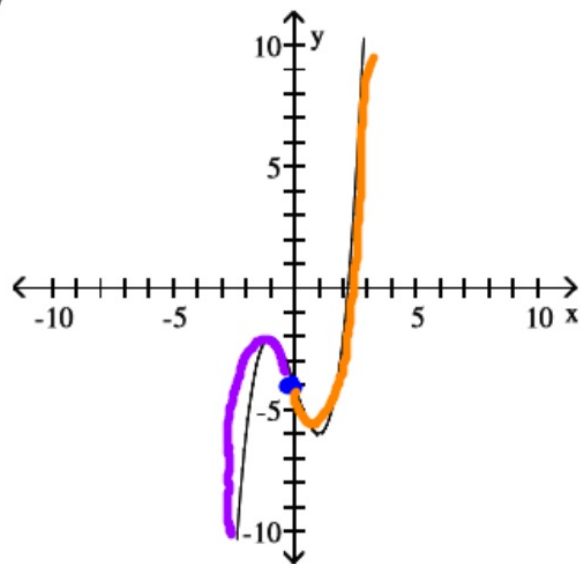
12) (1, 15)



$$y = 1^3 - 3(1)^2 + 2(1) + 15$$
$$= 1 - 3 + 2 + 15$$
$$= 15$$

Use the graph of f to estimate where f'' is 0, positive, and negative.

13)



$$f'' = 0 \quad \textcircled{0}$$
$$(0, -4)$$

$$f'' > 0$$
$$(0, \infty)$$

$$f'' < 0$$
$$(-\infty, 0)$$