

**Test for Concavity M/C Practice**

1. If  $f''(x) = (x - 1)(x + 2)^3(x - 4)^2$ , then the graph of  $f$  has inflection points when  $x =$

(A) -2 only

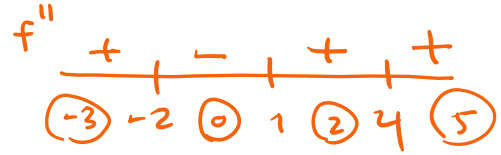
(B) 1 only

(C) 1 and 4 only

**(D)** -2 and 1 only

(E) -2, 1, and 4 only

$f'' = 0 @ x = 1,$   
 $x = -2$   
 $x = 4$



$f$  has inf. pts @  $x = -2$  and  $x = 1$   
b/c  $f''$  changes signs @  $x = -2$  and  $x = 1$

2. The function  $f(x) = xe^x$  has inflection points at:

**(A)** -2

(B) -1

(C) 0

(D) 1

(E) There are no inflection point of  $f$ .

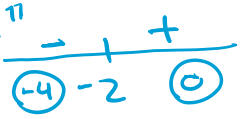
$f'(x) = e^x(1) + xe^x$   
 $= e^x + xe^x$

$f''(x) = e^x + e^x + xe^x$

$0 = 2e^x + xe^x$

$0 = e^x(2+x)$

$e^x \neq 0 \quad x = -2$



$f$  has inf pt @  $x = -2$  b/c  $f''$  changes signs @  $x = -2$ .

3. The number of inflection points of  $f(x) = 3x^7 - 10x^5$  is:

(A) 0

(B) 1

(C) 2

**(D)** 3

(E) 5

$f'(x) = 21x^6 - 50x^4$

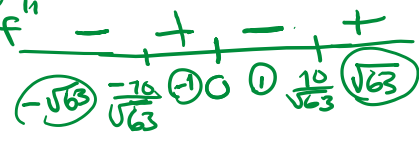
$f''(x) = 126x^5 - 200x^3$

$0 = 126x^5 - 200x^3$

$0 = 2x^3(63x^2 - 100)$

$0 = 2x^3(\sqrt{63}x - 10)(\sqrt{63}x + 10)$

$x = 0, x = \frac{10}{\sqrt{63}}, x = \frac{-10}{\sqrt{63}}$



$f$  has 3 inf. pts b/c  $f''$  changes signs three times.

4. For which of the following intervals is the graph of  $y = x^4 - 2x^3 - 12x^2$  concave down?

(A) (-2, 1)

**(B)** (-1, 2)

(C) (-2, -1)

(D)  $(-\infty, -1)$

(E)  $(-1, \infty)$

$y' = 4x^3 - 6x^2 - 24x$

$y'' = 12x^2 - 12x - 24$

$0 = 12(x^2 - x - 2)$

$0 = 12(x-2)(x+1)$

$x = 2, x = -1$



$y$  is concave down on  $(-1, 2)$  b/c  $y'' < 0$  on  $(-1, 2)$