

SOLUTIONS

Pg 1 of 1

① $f(x) = x^3 + 4x^2 - 9x - 36$

⊗ Degree = 3

⊗ LEADING COEFFICIENT POS

⊗ Intercepts

→ y-int: set $x=0$

$$f(0) = (0)^3 + 4(0)^2 - 9(0) - 36$$

$$= -36$$

$$\rightarrow (0, -36)$$

→ x-int: set $f=0$

$$\Rightarrow x^3 + 4x^2 - 9x - 36 = 0$$

Factor
By
Grouping

$$\Rightarrow x^2(x+4) - 9(x+4) = 0$$

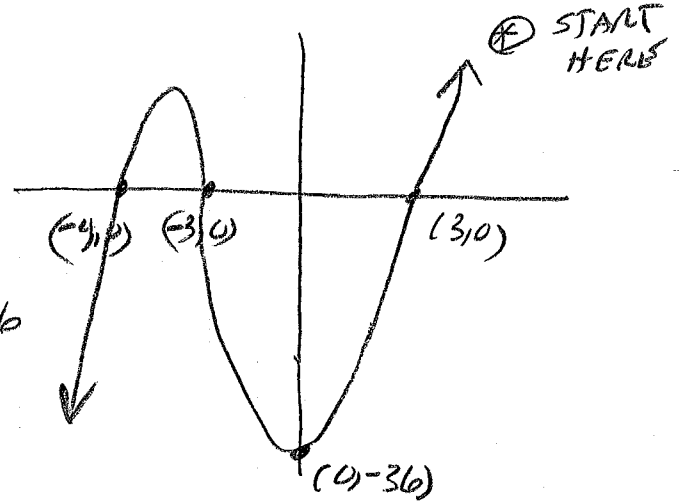
$$\Rightarrow (x+4)(x^2-9) = 0$$

$$\Rightarrow (x+4)(x+3)(x-3) = 0$$

$$\Rightarrow x+4=0 \quad x+3=0 \quad x-3=0$$

$$\Rightarrow x=-4 \quad x=-3 \quad x=3$$

⊗ Multiplicity $(-4, 0)$ $(-3, 0)$ $(3, 0)$
1 1 1



② $f(x) = x^4 - 3x^3 - 4x^2 + 12x$

⊗ Degree = 4 } $\Rightarrow$ $\curvearrowright$

⊗ L.C. $\Rightarrow$ pos }

⊗ Intercepts

$\rightarrow$ y-int: set $x=0$

$$f(0) = (0)^4 - 3(0)^3 - 4(0)^2 + 12(0)$$

$$= 0 \Rightarrow (0, 0)$$

$\rightarrow$ x-int: set $f(x)=0$

$$\Rightarrow x^4 - 3x^3 - 4x^2 + 12x = 0$$

see Hint:
FACTOR
OUT "x"

$$\Rightarrow x(x^3 - 3x^2 - 4x + 12) = 0$$

Now factor
by grouping

$$\Rightarrow x(x^2(x-3) - 4(x-3)) = 0$$

$$\Rightarrow x(x-3)(x^2 - 4) = 0$$

$$\Rightarrow x(x-3)(x+2)(x-2) = 0$$

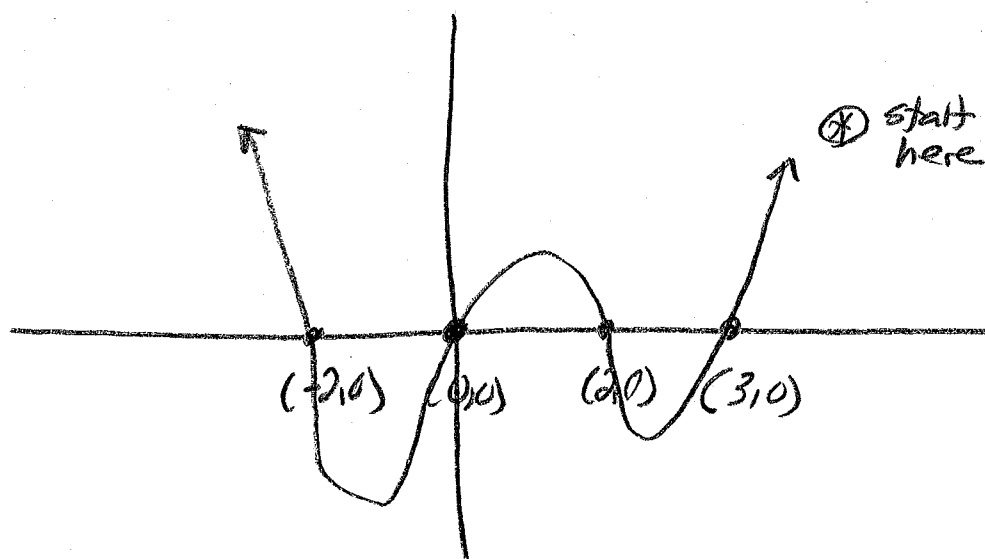
$$\Rightarrow x=0 \quad x-3=0 \quad x+2=0 \quad x-2=0$$

$$\Rightarrow x=0 \quad x=3 \quad x=-2 \quad x=2$$

$$(0, 0) \quad (3, 0) \quad (-2, 0) \quad (2, 0)$$

⊗ MULTIPlicity

1 1 1 1



$$(3) f(x) = (-x+2)(x+4)(x-5)(x+1)$$

NOTE:
ALREADY
FACTORED

(*) Degree: 4 }
(*) LEAD. COEFF. NEG } $\Rightarrow$ $\downarrow \downarrow$

(*) Intercepts:

$\rightarrow$ y-int: set $x=0$

$$f(0) = (-0+2)(0+4)(0-5)(0+1)$$

$$= (2)(4)(-5)(1)$$

$$= -40 \Rightarrow (0, -40)$$

$\rightarrow$ x-int: set $f=0$

$$\Rightarrow (-x+2)(x+4)(x-5)(x+1) = 0$$

$$\Rightarrow -x+2=0 \quad x+4=0 \quad x-5=0 \quad x+1=0$$

$$\Rightarrow -x=-2 \quad x=-4 \quad x=5 \quad x=-1$$

$$\Rightarrow x=2 \quad (-4, 0) \quad (5, 0) \quad (-1, 0)$$

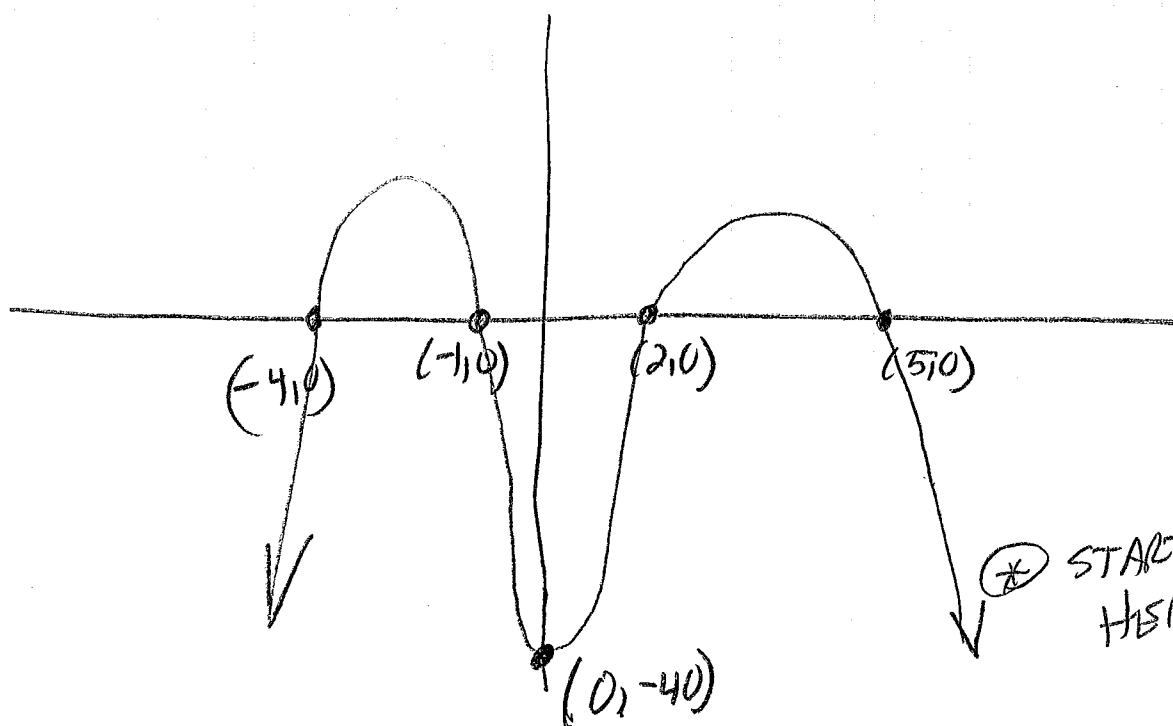
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1

(*) Multiplicities:



(*) START
HERE

④ $f(x) = (x-3)^2(x+2)^2$

* Degree = 4

* LEAD COEF. pos



* Intercepts:

→ y-int: set $x=0$

$$\begin{aligned} f(0) &= (0-3)^2(0+2)^2 \\ &= (-3)^2(2)^2 \\ &= (9)(4) \\ &= 36 \rightarrow (0, 36) \end{aligned}$$

→ x-int: set $f=0$

$$\Rightarrow (x-3)^2(x+2)^2 = 0$$

$$\Rightarrow (x-3)^2 = 0 \quad \text{OR} \quad (x+2)^2 = 0$$

$$\Rightarrow \sqrt{(x-3)^2} = \pm\sqrt{0} \quad \sqrt{(x+2)^2} = \pm\sqrt{0}$$

$$\Rightarrow x-3 = 0$$

$$\Rightarrow x+2 = 0$$

$$\Rightarrow x = 3$$

$$\Rightarrow x = -2$$

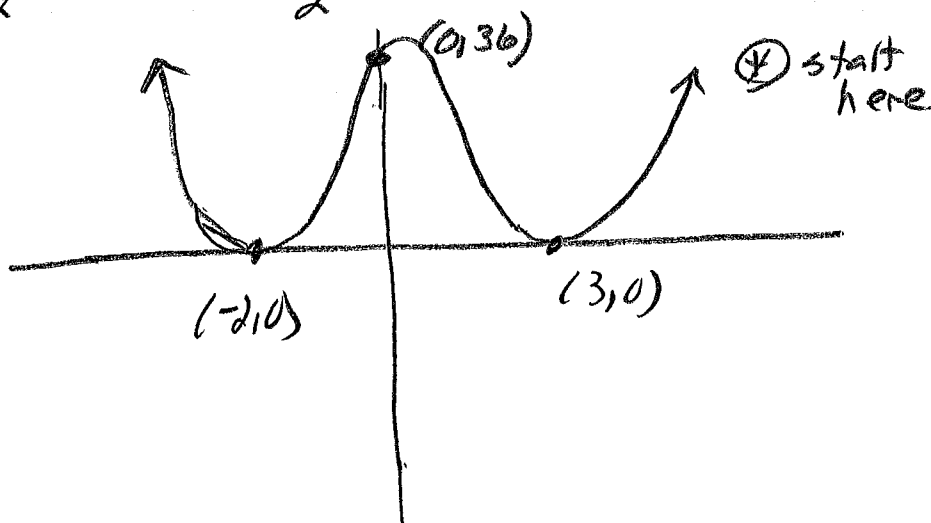
$$\Rightarrow (3, 0)$$

$$\Rightarrow (-2, 0)$$

* Multiplicity:

2

2



⑤. $f(x) = x^2(x+2)(-x+4)$

⊛ Degree = 4

⊛ L.C. $\Rightarrow$ NEG $\Rightarrow$

⊛ Intercepts $\rightarrow$ y-int: set $x=0$

$$f(0) = (0)^2(0+2)(-0+4)$$

$$= (0)(2)(4)$$

$$= 0 \Rightarrow (0,0)$$

$\rightarrow$ x-int: set $f=0$

$$x^2(x+2)(-x+4) = 0$$

$$\Rightarrow x^2=0 \quad x+2=0 \quad -x+4=0$$

$$\Rightarrow x=0 \quad x=-2 \quad -x=-4$$

$$x=4$$

$$(0,0)$$

$$(-2,0)$$

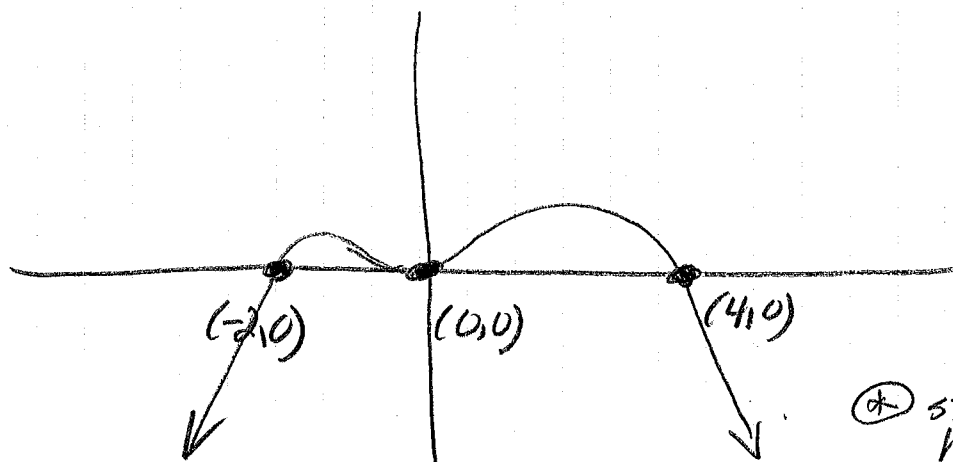
$$(4,0)$$

⊛ Multiplicities

2

1

1



⊛ start here

⑥ $f(x) = (x-1)^2(x+2)^3$

⊗ Degree = 5

⊗ Lead. Coef. = Pos

⊗ Intercepts

→ y-int: set $x=0$

$$f(0) = (0-1)^2(0+2)^3$$

$$= (-1)^2(2)^3$$

$$= (1)(8)$$

$$= 8 \rightarrow (0, 8)$$

→ x-int: set $f=0$

$$\Rightarrow (x-1)^2(x+2)^3 = 0$$

$$\Rightarrow (x-1)^2 = 0 \quad \text{or} \quad (x+2)^3 = 0$$

$$\Rightarrow \sqrt{(x-1)^2} = \pm\sqrt{0} \quad \sqrt[3]{(x+2)^3} = \sqrt[3]{0}$$

$$\Rightarrow x-1 = 0$$

$$\Rightarrow x+2 = 0$$

$$\Rightarrow x = 1$$

$$\Rightarrow x = -2$$

$$(1, 0)$$

$$(-2, 0)$$

⊗ Multiplicity

2

3

