

10/08/2018.

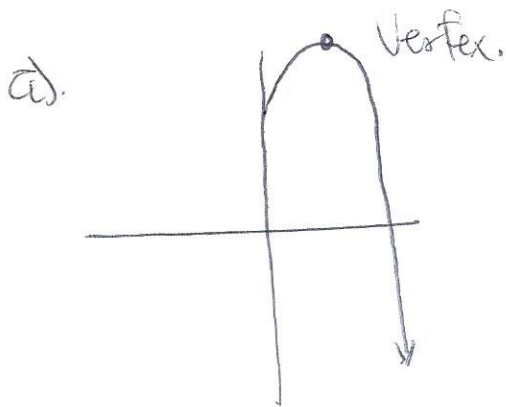
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MATH 2311  
Pre-Calculus I  
Ms. Palmer

Solution to quiz:

$$\textcircled{2} \quad r(t) = -3t^2 + 90t + 142.85.$$

$t$  = time in seconds ( $x$  values).

$r$  = height in feet ( $y$  values).



$$\begin{aligned} t &= \frac{-b}{2a} \\ &= \frac{-90}{2(-3)} = \frac{-90}{-6} = 15. \end{aligned}$$

15 seconds

$$\begin{aligned} \text{b.} \quad r(15) &= -3(15)^2 + 90(15) + 142.85 \\ &= 817.85 \text{ ft.} \end{aligned}$$

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

$$\begin{array}{cc} \wedge & \wedge \\ x & x \\ & -6 & 1 \end{array}$$

$$(x-6)(x+1)$$

Methods of solving a Quadratic.

- Factoring.
- Quadratic Formula.
- Completing the square.

Dividing Polynomials.

$$\frac{17}{3} \Rightarrow \begin{array}{r} 5 \\ \underline{3 \overline{) 17}} \\ 15 \\ \hline 2 \end{array} = 5 \frac{2}{3}$$

$$x^4 + 2x - 7 \Rightarrow x^4 + 0x^3 + 0x^2 + 2x - 7$$

Long Division:

$$(x^3 - 2x^2 + 5x - 7) \div (x+3)$$

$$\begin{array}{r} x^2 - 5x + 20 + \frac{-67}{x+3} \\ x+3 \overline{) x^3 - 2x^2 + 5x - 7} \\ \underline{-(x^3 + 3x^2)} \\ 0 - 5x^2 + 5x \\ \underline{-(-5x^2 - 15x)} \\ 0 + 20x - 7 \\ \underline{-(20x + 60)} \\ 0 - 67 \end{array}$$

Divide  $(x^3 - x^2 - 4x + 4) \div (x-1)$ .

$$\begin{array}{r} x^2 - 4 \\ (x-1) \overline{) x^3 - x^2 - 4x + 4} \\ \underline{-(x^3 - x^2)} \phantom{+ 4} \\ 0 + 0 - 4x + 4 \\ \underline{-(-4x + 4)} \\ 0 \phantom{+ 0} + 4 - 4 \end{array}$$

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

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

Synthetic Division:

$$x^3 - 2x^2 + 5x - 7 \div (x+3)$$

Divide by the zero factor.

$$x+3=0$$

$$x+3=0$$

$$x=-3$$

$$\begin{array}{r|rrrr} -3 & 1 & -2 & 5 & -7 \\ & \downarrow & + & + & + \\ & & -3 & 15 & -60 \\ \hline & 1 & -5 & 20 & -67 \end{array}$$

$$= \cancel{x^2 - 5x^2}$$

$$x^2 - 5x + 20 + \frac{-67}{x+3}$$

$$x+3$$

# Rational Roots Theorem:

$$f(x) = \underset{\substack{\uparrow \\ \text{leading} \\ \text{coefficient.} \\ \mathbf{q}}}{3}x^5 - \underset{\substack{\uparrow \\ \text{constant.} \\ \mathbf{p}}}{5}x^3 + 2x^2 + 5$$

$$\pm \frac{\text{Factors of constant}}{\text{Factors of leading coefficient}} \Rightarrow \text{possible rational roots.}$$

$$p: 1, 5.$$

$$q: 1, 3$$

$$\begin{aligned} \text{P.R.R.} &: \pm \frac{1}{1}, \pm \frac{5}{1}, \pm \frac{1}{3}, \pm \frac{5}{3} \\ &= \pm 1, \pm 5, \pm \frac{1}{3}, \pm \frac{5}{3}. \end{aligned}$$

Find the possible rational roots of  $f(x) = x^4 - 2x^3 + x^2 + 8x - 6$ .

$$p: 1, 2, 3, 6.$$

$$q: 1, 2, 4$$

$$\begin{aligned} \text{P.R.R.} &: \pm \frac{1}{1}, \pm \frac{2}{1}, \pm \frac{3}{1}, \pm \frac{6}{1}, \pm \frac{1}{2}, \pm \frac{2}{2}, \pm \frac{3}{2}, \pm \frac{6}{2}, \pm \frac{1}{4}, \pm \frac{2}{4}, \pm \frac{3}{4}, \pm \frac{6}{4}, \\ &\pm \frac{6}{4}. \end{aligned}$$

$$= \pm 1, \pm 2, \pm 3, \pm 6, \pm \frac{1}{2}, \pm \frac{3}{2}, \pm \frac{1}{4}, \pm \frac{3}{4},$$

$$f(x) = x^3 - 13x^2 + 23x - 11$$

Write in factored form.

$$P: R: R \quad \pm 1, \pm 11$$

$$f(1) = (1)^3 - 13(1)^2 + 23(1) - 11 = 0$$

1 is a root.

$(x-1)$  is a factor.

1	-13	23	-11
	1	-12	11
	-12	11	0

$$x^2 - 12x + 11$$

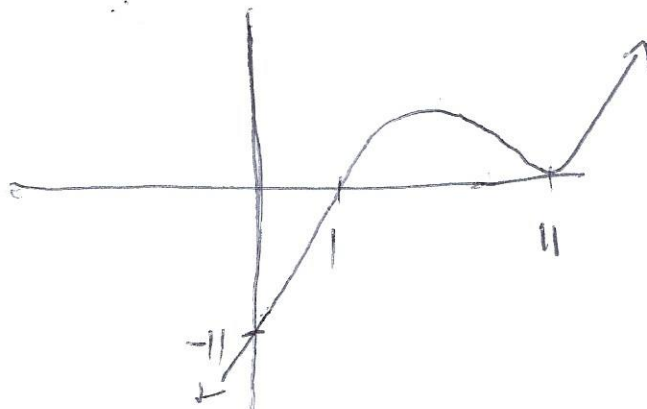
$$\begin{aligned} \therefore x^3 - 13x^2 + 23x - 11 &= (x-1)(x^2 - 12x + 11) \\ &= (x-1)(x-11)(x-1) \\ &= (x-11)(x-1)^2 \end{aligned}$$

Zeros:  $x=11$ ,  $x=1$ .

mult of 1      mult of 2.

C

B.



## Practice Problems:

Write the following in factored form, then find the zeros and multiplicities, Graph the function.

①  $f(x) = x^3 + x^2 - 5x + 3$ .

②  $f(x) = 5x^3 + 29x^2 + 19x - 5$ .

③  $f(x) = x^4 + x^3 - 3x^2 - 3x$ .

④  $f(x) = 2x^3 + 9x^2 + 19x - 5$ .

Solution:

①  $f(x) = x^3 + x^2 - 5x + 3$   $\rightarrow P$   
     $\downarrow$   
     $Q$

$P: R: R: \pm 3, \pm 1$

$$f(x) = (1)^3 + (1)^2 - 5(1) + 3 = 0$$

$(x-1)$  is a factor.

$$\begin{array}{r} 1 \overline{) x^3 + x^2 - 5x + 3} \\ \hline \end{array}$$

$$\begin{array}{r} \overline{) 1 \quad 1 \quad -5 \quad 3} \\ \hline \end{array}$$

$$\begin{array}{r} \overline{) 1 \quad +1 \quad -5 \quad 3} \\ \hline 1 \quad 2 \quad -3 \quad 0 \end{array}$$

$$\Rightarrow x^2 + 2x - 3$$

$$(x-1)(x^2+2x-3)$$

$$\Rightarrow (x-1)(x+3)(x-1)$$

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

~~2)~~ Zeros :  $x = -3, x = 1$   
Mult:     1         2  
           C         B.

E: B: L: D, R: 4.