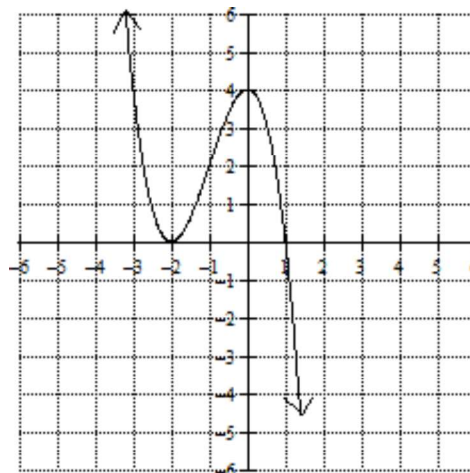


Homework 3.2

The graph of a polynomial function, $f(x)$ is pictured to the right. Use the graph to identify the value(s) of x for which each equation in the box below is true.



1. $f(x) = 0$	$x = -2$ and 1
2. $f(x) > 0$	$(-\infty, -2) \cup (-2, 1)$
3. $f(x) < 0$	$(1, \infty)$
4. $f(x) \geq 0$	$[-\infty, 1]$
5. $f(x) \leq 0$	$x = -2, [1, \infty)$

Solve each of the following polynomial inequalities by performing a sign analysis. Check your answers using a graphing calculator. If a polynomial is not algebraically factorable, you will have to solve the inequality graphically, completely using the graphing calculator. Still draw the number line, marked off by the zeros, and determine and label each interval to be positive or negative based upon the graph.

6. $x^3 - 2x^2 > 15x$

$$x^3 - 2x^2 - 15x = 0$$

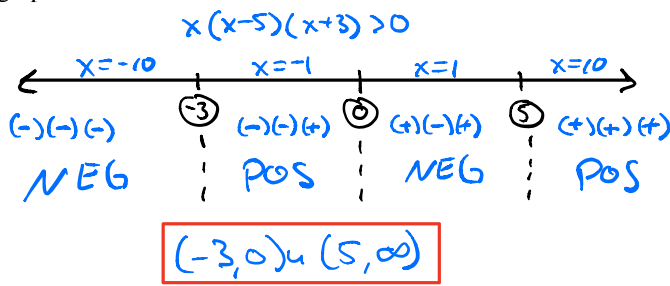
$$x(x^2 - 2x - 15) = 0$$

$$x(x^2 - 5x + 3x - 15) = 0$$

$$x[x(x-5) + 3(x-5)] = 0$$

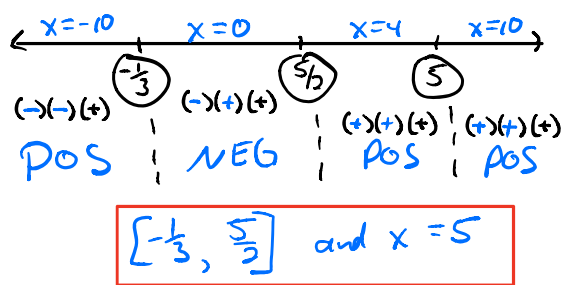
$$x(x-5)(x+3) = 0$$

$$x=0 \quad \left. \begin{matrix} x-5=0 \\ x+3=0 \end{matrix} \right\} \begin{matrix} x=5 \\ x=-3 \end{matrix}$$



7. $(2x - 5)(3x + 1)(x - 5)^2 \leq 0$

$$\left. \begin{matrix} 2x-5=0 \\ 3x+1=0 \\ (x-5)^2=0 \end{matrix} \right\} \begin{matrix} 2x=5 \\ 3x=-1 \\ x-5=0 \end{matrix} \left\{ \begin{matrix} x=5/2 \\ x=-1/3 \\ x=5 \end{matrix} \right.$$



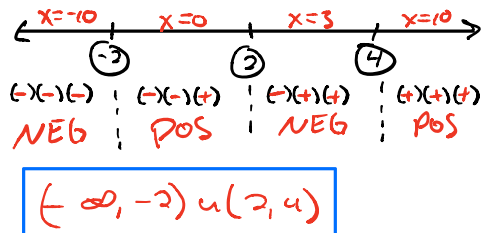
8. $x^3 - 4x^2 - 4x + 16 < 0$

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

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

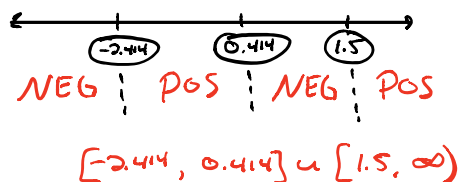
$$(x-4)(x-2)(x+2) = 0$$

$$x-4=0 \quad \left\{ \begin{matrix} x-2=0 \\ x+2=0 \end{matrix} \right\} \begin{matrix} x=4 \\ x=2 \\ x=-2 \end{matrix}$$



9. $2x^3 + x^2 - 8x + 3 \geq 0$ (Calculator Active)

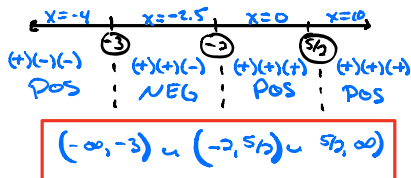
$x = -2.414, 0.414, 1.500$



10. $(2x - 5)^2(x + 3)(x + 2) > 0$

$$\begin{aligned} (2x - 5)^2 = 0 & \left. \begin{array}{l} x + 3 = 0 \\ x + 2 = 0 \end{array} \right\} x = -3 \quad x = -2 \\ 2x - 5 = 0 & \\ 2x = 5 & \\ x = 5/2 & \end{aligned}$$

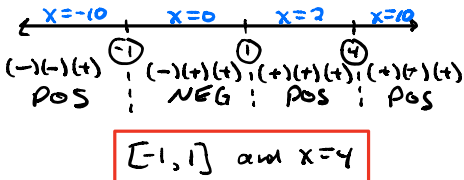
$x = -3, x = -2, x = 5/2$



11. $(x^2 - 1)(x - 4)^2 \leq 0$

$$\begin{aligned} (x-1)(x+1)(x-4)^2 = 0 \\ x-1 = 0 \quad x+1 = 0 \quad (x-4)^2 = 0 \\ x = 1 \quad x = -1 \quad x - 4 = 0 \\ \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad x = 4 \end{aligned}$$

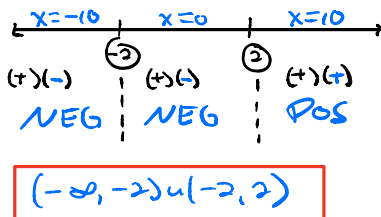
$x = -1, 1, 4$



12. $x^3 + 2x^2 - 4x < 8$

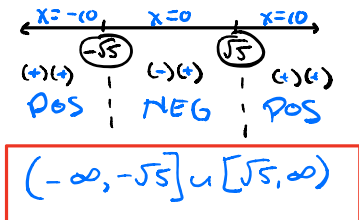
$$\begin{aligned} x^3 + 2x^2 - 4x - 8 = 0 \\ x^2(x+2) - 4(x+2) = 0 \\ (x+2)(x^2-4) = 0 \\ (x+2)(x+2)(x-2) = 0 \\ (x+2)^2(x-2) = 0 \\ (x+2) = 0 \quad x-2 = 0 \\ x+2 = 0 \quad x = 2 \\ x = -2 \end{aligned}$$

$x = -2, 2$



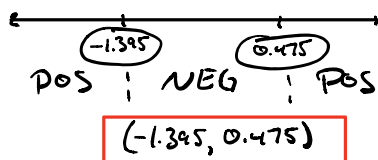
13. $x^4 - 3x^2 - 10 \geq 0$

$$\begin{aligned} x^4 - 5x^2 + 2x^2 - 10 = 0 \\ x^2(x^2-5) + 2(x^2-5) = 0 \\ (x^2-5)(x^2+2) = 0 \\ x^2-5 = 0 \quad x^2+2 = 0 \\ x^2 = 5 \quad x^2 = -2 \\ x = \pm\sqrt{5} \quad x = \pm i\sqrt{2} \end{aligned}$$



14. $x^4 + 2x - 1 < 0$ (Calculator Active)

$x = -1.395, 0.475$



15. $x^4 < 3x^2 + x$ (Calculator Active)

$x^4 - 3x^2 - x < 0$

$x = -1.532, -0.347, 0, 1.879$

