

WARM UP

Find all solutions to the quadratic equations. Show all work.

1. $(4x + 2)^2 = 25$

2. $4x^2 + 25x - 21 = 0$

3. $6x = 3x^2 + 1$

4. $49x^2 - 36 = 0$

5. $\frac{x^2}{4} + \frac{5x}{4} = -\frac{3}{2}$

$$\textcircled{1.} (4x+2)^2 = 25$$

$$4x+2 = \pm\sqrt{25}$$

$$4x+2 = \pm 5$$

$$4x = -2 \pm 5$$

$$x = \frac{-2 \pm 5}{4}$$

$$x = \frac{-2+5}{4} = \boxed{\frac{3}{4}}$$

$$x = \frac{-2-5}{4} = \boxed{\frac{-7}{4}}$$

$$(2) \quad \underline{4x^2} + \underline{25x} - 21 = 0$$

$$(4x^2 - 3x) + (28x - 21) = 0$$

$$x(4x - 3) + 7(4x - 3) = 0$$

$$(x + 7)(4x - 3) = 0$$

$$x + 7 = 0$$

$$x = -7$$

$$4x - 3 = 0$$

$$4x = 3$$

$$x = \frac{3}{4}$$

$$\begin{array}{r} -84 \\ \hline -3 \quad 28 \\ \hline 25 \end{array}$$

2 · 42
3 · 28

$$(3) \quad 6x = 3x^2 + 1$$

$$0 = 3x^2 - 6x + 1$$

$$a = 3 \quad b = -6 \quad c = 1$$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(3)(1)}}{2(3)}$$

$$x = \frac{6 \pm \sqrt{24}}{6}$$

$$x = \frac{6}{6} \pm \frac{\sqrt{24}}{6}$$

$$x = 1 \pm \frac{\sqrt{24}}{6} = \boxed{1 \pm \frac{1}{3}\sqrt{6}}$$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\underline{a}x^2 + \underline{b}x + \underline{c} = 0$$

$$\begin{aligned} \sqrt{24} &= \sqrt{4 \cdot 6} \\ &= \sqrt{4} \cdot \sqrt{6} \\ &= 2\sqrt{6} \end{aligned}$$

4. $49x^2 - 36 = 0$ ← Difference of Squares

$$(7x - 6)(7x + 6) = 0$$

$$7x - 6 = 0$$

$$7x = 6$$

$$x = \frac{6}{7}$$

$$7x + 6 = 0$$

$$7x = -6$$

$$x = -\frac{6}{7}$$

$$49x^2 - 36 = 0$$

$$49x^2 = 36$$

$$x^2 = \frac{36}{49}$$

$$x = \pm \sqrt{\frac{36}{49}}$$

$$x = \pm \frac{\sqrt{36}}{\sqrt{49}}$$

$$x = \pm \frac{6}{7}$$

5. $\frac{x^2}{4} + \frac{5x}{4} = -\frac{3}{2}$

$$\frac{x^2}{4} + \frac{5x}{4} = -\frac{3}{2}$$

$$x^2 + 5x = -6$$

$$x^2 + 5x + 6 = 0$$

$$(x+2)(x+3) = 0$$

$$x+2=0$$

$$x = -2$$

$$x+3=0$$

$$x = -3$$

$$\begin{array}{r} 6 \\ 2 \times 3 \\ \hline 5 \end{array}$$

WARM - UP

Factor Completely.

① $2n^2 + 3n - 9$

$$\begin{array}{cc} & -18 \\ -3 & \times & 6 \\ & 3 & \end{array}$$

$$(2n^2 - 3n) + (6n - 9)$$

$$n(2n - 3) + 3(2n - 3)$$

$$(n + 3)(2n - 3)$$

② $5n^2 + 19n + 12$

$$\begin{array}{cc} & 60 \\ 4 & \times & 15 \\ & 19 & \end{array} \quad \begin{array}{l} 1 \cdot 60 \\ 2 \cdot 30 \\ 3 \cdot 20 \\ 4 \cdot 15 \end{array}$$

$$(5n^2 + 4n) + (15n + 12)$$

$$n(5n + 4) + 3(5n + 4)$$

$$(n + 3)(5n + 4)$$

2B.3 End Behavior + graphs of Polynomial Functions
(2.2)Continuous Function

the graphs have no breaks, holes, or gaps

① Polynomial functions are continuous② The graphs of polynomial functions have only nice, smooth turns + bends.

③ The equation:

$$f(x) = ax^n + bx^{n-1} + \dots$$

$$g(x) = 2x^2 + 3x + 2$$

END BEHAVIOR

Polynomial

$$f(x) = ax^n + \dots$$

degree

n is even	n is odd
\nwarrow $\uparrow a > 0$ \swarrow $\downarrow a < 0$	\nwarrow $\uparrow a > 0$ \swarrow $\downarrow a < 0$

(EX1) Describe the right + left hand behavior of the graph of each function.

a.) $f(x) = -x^4 + 7x^3 - 14x - 9$

degree: 4 (even)

a: -1 ($a < 0$)

falling left
falling right

b.) $g(x) = 5x^5 + 2x^3 - 14x^2 + 6$

falling left
rising right

ZEROS of Polynomial Functions

ZEROS

x-intercepts
solutions
roots

Find the zeros of:

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

$$x^3 - x^2 - x + 1 = 0 \quad \text{*set equal to zero}$$

$$(x^3 - x^2) + (-x + 1) = 0 \quad \text{*factor by grouping}$$

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

$$(x^2 - 1)(x-1) = 0$$

$$x^2 - 1 = 0$$

$$x - 1 = 0$$

$$x^2 = 1$$

$$x = \pm 1$$

$$x = 1$$



EXS Sketch the graph of

$$f(x) = x^3 - 2x^2$$

1st END BEHAVIOR

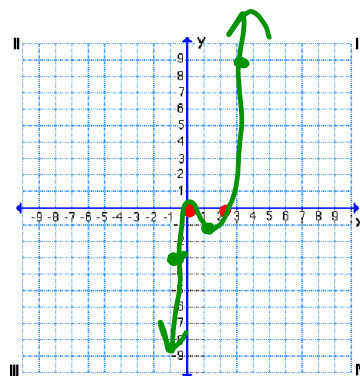
2nd FIND ZEROS

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

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

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

$$x = 0 \quad x = 2$$



3rd ADDITIONAL POINTS

x	y = x ³ - 2x ²
-1	(-1) ³ - 2(1) ² = -3
1	1 ³ - 2(1) ² = -1
3	27 - 2(9) = 27 - 18 = 9

Choose x's on either side of zeros

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

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

$$27 - 2(9)$$

$$27 - 18 = 9$$

2B.3
 p.108-109
 #1-8, 9, 17-20, 35-38, 47, 48, 53
 p.123-126
 #7, 8, 35-37, 49-52

GP Sketch the graph.

$$f(x) = x^3 - x^2 - 6x$$

Zeros

$$f(x) = x^3 - x^2 - 6x$$

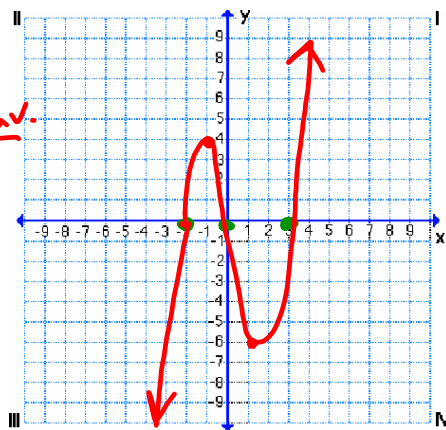
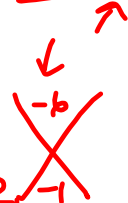
$$0 = x(x^2 - x - 6)$$

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

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

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

End Behav.



Additional Points

x	y = x ³ - x ² - 6x
-3	-27 - 9 + 18 = -18
-1	4
1	-6
4	24



Ex4 Find the polynomial function that has given zeros.

0, 2, 5

$$\begin{aligned} f(x) &= (x-0)(x-2)(x-5) \\ &= x(x-2)(x-5) \\ &= x(x^2-7x+10) \\ &= \boxed{x^3-7x^2+10x} \end{aligned}$$

$$\begin{array}{r|l} & x-5 \\ x & x^2-5x \\ -2 & -2x \quad 10 \\ \hline & x^2-7x+10 \end{array}$$

GP Find the polynomial function that has the given zeros.

-1, 3, 4

$$\begin{aligned} f(x) &= (x+1)(x-3)(x-4) \\ &= (x+1)(x^2-7x+12) \\ &= \boxed{x^3-6x^2+5x+12} \end{aligned}$$

$$\begin{array}{r|l} & x-3 \\ x & x^2-3x \\ -4 & -4x \quad 12 \\ \hline & x^2-7x+12 \end{array}$$

$$\begin{array}{r|l} & x^2-7x+12 \\ x & x^3-7x^2+12x \\ 1 & x^2-7x+12 \\ \hline & x^3-6x^2+5x+12 \end{array}$$

KAHOOT.IT

<https://play.kahoot.it/#/k/eb6046ad-5553-4dd2-934d-c10d31d9003a>