Bellwork 9/20:
Solve using the Quadratic Formula.
1. \(0 = x^2 + 8x + 11\)
\[x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-8 \pm \sqrt{64 - 44}}{2} = \frac{-8 \pm \sqrt{20}}{2} = \frac{-8 \pm 2\sqrt{5}}{2} = -4 \pm \sqrt{5}\]

2. \(b^2 - 5c + 9 = 0\)
\[x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{5 \pm \sqrt{(-5)^2 - 4(1)(9)}}{2(1)} = \frac{5 \pm \sqrt{-11}}{2} = \frac{5 \pm i\sqrt{11}}{2}\]

2.1 homework key
p 132
7. e 8. c 9. b 10. a 11. f 12. d
25. v: (4, 0) a of s: x = 4, x-int (4, 0)
30. v: (4, 1) a of s: x = 2
37. v: (-4, -5) a of s: x = 4
40. v: (3, -5) a of s: x = 3
43. y = -(x+1)x + 4
58. (-3, 0), (1/2, 0)
76. a. 1.5 ft
c. about 226.64 ft
78. $2000
80. a. $408, $468, $432
b. $6.25 per pet; $468.75 explain

2.2 Polynomial Functions of Higher Degree

Objective: SWBAT graph and describe polynomial functions.

Factoring Practice
1. \(x^2 + 10x + 25\)
2. \(x^3 - 5x^2 + 6x\)
3. \(2m^2n - 17mn^2 + 2n^3\)
4. \(x^2 - 36\)
5. 49 - 4n^2

Sep 19-9:43 PM

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**Vocabulary:**

Polynomial functions must be continuous with only smooth curves

**Examples**

\[ y = x^2 \]
\[ y = x^3 + 2x - 7 \]

**Nonexamples**

\[ y = \left\{ \begin{array}{ll} x^2 & \text{if } x > 0 \\ 2x + 1 & \text{if } x < 0 \end{array} \right. \]

Standard form of a polynomial: terms written in descending order of exponents

The degree of a polynomial is the largest exponent of the function

\[ 5x^3 + 4x^2 - 3 + 2x^2 - x - 7 \]

**End behavior *leading coefficient theorem***

<table>
<thead>
<tr>
<th>Degree (n) is even</th>
<th>Degree (n) is odd</th>
</tr>
</thead>
<tbody>
<tr>
<td>( a_n &gt; 0 )</td>
<td>Positive leading coefficient</td>
</tr>
<tr>
<td>( a_n &lt; 0 )</td>
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**Leading Term Test:**

- \( n \) odd, \( a_n \) positive
- \( n \) odd, \( a_n \) negative
- \( n \) even, \( a_n \) positive
- \( n \) even, \( a_n \) negative
Example 1:

Describe the right-hand and le-hand behavior of the graph using limits

\[
\begin{align*}
\text{f}(x) &= 3x^4 - x^3 + x^2 + x - 1 \\
\text{f}(x) &= -2x^4 - 1 \\
\text{f}(x) &= -3x^4 + 6x^3 - 2
\end{align*}
\]

Example 2:

a) find degree and apply leading term test (end behavior)
b) find all real zeros by factoring
c) state multiplicity of any repeated zeros

\[
\begin{align*}
f(x) &= x^3 + 5x^2 + 4x \\
\text{b) } & n = 3, \text{Mul: } 3 \\
\text{c) } & x = 0, x + 1 = 0
\end{align*}
\]

Zeros and Turning Points:

A polynomial function \( f \) of degree \( n \) has at most \( n \) distinct real zeros and at most \( n - 1 \) turning points.

What are zeros?

* \( x = a \) is a solution of the function \( f \)
* \( x = a \) is a solution of the equation \( f(x) = 0 \)
* \( x - a \) is a factor of the polynomial \( f \)
* \( (a, 0) \) is an x-intercept of the graph \( f \)

A factor \((x - a)^k\) means the zero is repeated, called multiplicity\n
\[
\begin{align*}
\uparrow & \text{ If multiplicity is odd, the graph crosses at } x = a \\
\leftrightarrow & \text{ If multiplicity is even, the graph touches at } x = a
\end{align*}
\]

Example 2:

a) find degree and apply leading term test (end behavior)
b) find all real zeros by factoring
c) state multiplicity of any repeated zeros

\[
\begin{align*}
f(x) &= x^4 - 13x^2 + 36 \\
\text{b) } & (x^2 - 9)(x^2 - 4) = 0 \\
& (x + 3)(x - 3)(x + 2)(x - 2) = 0 \\
& x = -3, 3, 2, -2
\end{align*}
\]
Example 2:

a) Find degree and apply leading term test (end behavior)
b) Find all real zeros by factoring
c) State multiplicity of any repeated zeros

\[ f(x) = 36 - x^2 \]

\( a) \ n = 2, \ \uparrow \downarrow \)

\( b) \ (6-x)(6+x) = 0 \)

\( 6-x=0 \quad x=6 \)

\( 6+x=0 \quad x=-6 \)

\( c) \ \text{multiplicity of 1} \)

Example 3: Do a - c and sketch a graph

\[ f(x) = 3x^4 - 4x^3 \]

\( a) \ n=4, \ \uparrow \uparrow \)

\( b) \ y^2(3x-y) = 0 \)

\( y^2 = 0 \quad 3x-y = 0 \)

\( x = \frac{y}{3} \text{ multiplicity 3} \)

Example 4: Find a polynomial function that has the given zeros and degree.

\[ x = -3, \ \text{degree } n = 2 \]

\( (x+3)^2 \)

\[ x^2 + 9x + 9 \]

\[ x = 0, -5, \ \text{degree } = 5 \]

\( (x-0)(x+5) \)

\( x^5 + 5x^4 \)
2.2 assignment:

pg 146 # 17, 22, 24, 25, 26, 36, 44, 46, 48, 52, 66, 67, 105, 106, 107