TODAY'S AGENDA
○ Socratic (groups)
○ Check HW Worksheet
○ Unfair Game!
○ Review Worksheet

Quest #2: MONDAY
part calculator, part non-calculator

Partner Practice
Complete 10 question socratic
  socrative.com (CALCULATORS FOR #9-10!)
  room: CHECK2 or CHECK3
  (ID # is cell phone slot #)

When finished, work on Study Book
○ minimum requirement: 1 page front AND back
○ include theorems, rules, example problems, etc
○ Make it useful to YOU!

Quest #2: MONDAY
9. Can use a calculator
The value of Jen's stock portfolio is given by \( v(t) = -30t^2 + 750t + 500 \), where \( v \) is the value of the portfolio and \( t \) is time in months. What was the maximum value of Jen's stock portfolio?

10. Can use a calculator
A diver dives off a 14 ft high dive and after 3 seconds reaches her maximum height of 22 ft. Identify the "a" value if the quadratic was written in standard (vertex) form. (just type the number)

\[
y = a(x-h)^2 + k
\]

\[
14 = a(0-3)^2 + 22
\]

\[
-8 = a \cdot 9
\]

\[
a = -\frac{8}{9}
\]

**Homework Check**

1. \( y = 2x^3 - 5x^2 - 28x + 15 \)
   - possible positive roots: \( \pm 2, \pm 3 \)
   - possible negative roots: \( \pm 1 \)
   - is \( 1 \) a root? \( No \) \( 2 - 5 - 28 + 15 \neq 0 \)
   - RZT: \( \frac{2 - 5 - 28 + 15}{1 - 2 - 1} = \frac{-11}{-4} = \frac{11}{4} \)
   - roots: \( x = -3, \frac{1}{3}, 5 \)

2. \( f(x) = 2x^4 - 2x^2 - 40 \)
   - possible positive roots: \( + \)
   - possible negative roots: \( - \)
   - \( 0 = 2(x^2 - 5)(x^2 + 4) \)
   - \( x^2 - 5 = 0 \)
   - \( x^2 = 5 \)
   - \( x = \pm \sqrt{5} \)
   - \( x^2 + 4 = 0 \)
   - \( x^2 = -4 \)
   - \( x = \pm 2i \)

**Roots:**

\( x = -3, \frac{1}{3}, 5 \)

\( x = \pm \sqrt{5}, \pm 2i \)
3. \( f(x) = x^4 + x^3 - 13x^2 - x + 12 \)

<table>
<thead>
<tr>
<th>Possible roots:</th>
<th>2 or 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ( + - - + )</td>
<td>Yes!</td>
</tr>
<tr>
<td>Is ( x ) a root?</td>
<td>Yes!</td>
</tr>
<tr>
<td>1 ( -1 -13 +1 +12 = 0 )</td>
<td></td>
</tr>
<tr>
<td>RZT:</td>
<td>1 ( ; 2 ) ( ; 3 ) ( ; 4 ) ( ; 6 ) ( ; 1 )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>( x = -4, -1, 1, 3 )</td>
</tr>
</tbody>
</table>

4. \( f(x) = x^4 - 4x^3 - 7x^2 + 34x - 24 \)

<table>
<thead>
<tr>
<th>Possible roots:</th>
<th>3 or 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ( + - - - )</td>
<td>No</td>
</tr>
<tr>
<td>Is ( x ) a root?</td>
<td>No</td>
</tr>
<tr>
<td>1 ( -4 -7 +34 -24 = 0 )</td>
<td></td>
</tr>
<tr>
<td>RZT:</td>
<td>1 ( ; 2 ) ( ; 3 ) ( ; 4 ) ( ; 6 ) ( ; 8 ) ( ; 12 ) ( ; 24 )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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</tr>
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<tbody>
<tr>
<td>( x = -3, 1, 2, 4 )</td>
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</table>

5. \( f(x) = x^3 - 2x^2 - 4x + 8 \)

<table>
<thead>
<tr>
<th>( 0 )</th>
<th>( (x^3 - 2x^2)(-4x + 8) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 0 )</td>
<td>( x^2(x - 2) - 4(x - 2) )</td>
</tr>
<tr>
<td>( 0 )</td>
<td>( (x^2 - 4)(x - 2) )</td>
</tr>
<tr>
<td>( x = \pm 2 )</td>
<td>( x = 2 )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>( x = -2, 2 )</td>
</tr>
</tbody>
</table>

6. \( f(x) = x^3 + 2x^2 + x + 2 \)

<table>
<thead>
<tr>
<th>Possible roots:</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ( + - - + )</td>
<td>No</td>
</tr>
<tr>
<td>Is ( x ) a root?</td>
<td>No</td>
</tr>
<tr>
<td>1 ( -4 -1 +2 = 0 )</td>
<td></td>
</tr>
<tr>
<td>RZT:</td>
<td>1 ( ; 2 ) ( ; 3 ) ( \frac{-4 \pm \sqrt{17}}{2} ) ( ; 6 ) ( ; 1 )</td>
</tr>
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<table>
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<tr>
<th>Roots:</th>
</tr>
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<tr>
<td>( x = 1, \frac{3 \pm \sqrt{17}}{2} )</td>
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</table>

**Part 2:** Answer the following applications. You may use your graphing calculator but must justify with algebraic work.

7. A medical research lab is testing a new drug on a patient. The amount of the drug remaining in the patient's bloodstream 8 hours after the drug is administered can be modeled by the equation:

\( f(x) = -2x^3 + 6x^2 - 8x + 8 \). Determine how many hours after administration will the drug be totally eliminated from the patient's bloodstream.

\( \frac{3 - 2}{-4} \) \( \frac{-8}{8} \) \( 2 \) \( \frac{1}{-2} \) \( \frac{2}{-4} \) \( 2 \) \( \text{hours} \)
8. Jack buys a water tank that has a height 3 inches greater than the length of each side of its square base. If the water tank has a volume of 112 cubic inches, what is the height of the water tank? Create a function to model this scenario.

\[ V = l \cdot w \cdot h \]
\[ 112 = x \cdot x \cdot (x+3) \]
\[ 112 = x^3 + 3x^2 \]

\[ f(x) = x^3 + 3x^2 - 112 \]

\[ \frac{1}{4} \quad 1 \
\[ 3 \
\[ 0 \
\[ -112 
\]

\[ x = 4 \]

height: 7 in

Part 3: Use the Intermediate Value Theorem and justify with algebraic work to determine if there must be a root in the given interval.

9. \( f(x) = x^5 - 2x^3 - 2 \) \([1, 2]\)

\[ \begin{array}{c|cccc}
0 & 0 & 0 & 0 & -2 \\
1 & 1 & -1 & -1 & -3 \\
2 & 1 & 2 & 4 & 8 & 14 \\
\end{array} \]

\( \text{Yes} \)

10. \( f(x) = x^4 - 8x^2 + 10 \) \([-4, -3]\)

\[ \begin{array}{c|cccc}
1 & 0 & -8 & 0 & 10 \\
-3 & 1 & -3 & 1 & -3 \\
-4 & 1 & -4 & 8 & -32 & 138 \\
\end{array} \]

\( \text{No} \)
1) Write in standard form.

\[ f(x) = \left( -\frac{1}{3} x^2 + 3x \right) - 6 \left( -\frac{9}{2} \right)^2 - \frac{1}{3} \left( x^2 - 9x + \frac{81}{4} \right) - 6 - \frac{27}{4} = -9 \]

\[ f(x) = \frac{-1}{3} \left( x - \frac{9}{2} \right)^2 + \frac{3}{4} \]

2) Write the standard form of the equation of the parabola that has a vertex of \((2, -3)\) and passes through the point \((-1, 9)\).

\[ y = \frac{4}{3} (x - 2)^2 - 3 \]
3) Identify the degree and if the leading coefficient is positive or negative.

Degree: 5
LC: negative

4) Write the equation.

\[-1(x+2)(x+2)(x-1)\]

\[f(x) = -x^3 - 3x^2 + 4\]
5) The following equation represents the path of a kickball being kicked, where \( x \) represents the time (in seconds) and \( y \) represents the height (in feet) of the ball.

\[ y = -(x - 4)^2 + 17 \]

When does the kickball land? Round answer to 2 decimal places.

\[ 0 = - (x-4)^2 + 17 \]
\[ -17 = -(x-4)^2 \]
\[ 17 = (x-4)^2 \]
\[ \sqrt{17} = x-4 \]
\[ x = \sqrt{17} + 4 \]

\[ x = 8.12 \text{ sec} \]

6) The total revenue \( R \) earned (in thousands of dollars) for manufacturing PlayStation 3 games is given by \( R(p) = -25p^2 + 1200p \), where \( p \) is the price per unit in dollars.

At what price per unit will revenue be maximized? \( \text{Max} \)

\[ x = \frac{-b}{2a} = \frac{-1200}{2(-25)} = 24 \]
- True/False; Mult Ch; Short Answer
- Graphing Quadratics
- Standard Form of Quadratic (completing the square)
- Leading Coefficient Test
- Graphing Polynomials
- Descartes Rule of Signs
- Upper and Lower Bound Theorem
- Rational Zero Test

- Quadratic Applications
- Synthetic Division
- Remainder Theorem
- Approximating Zeros using Intermediate Value Theorem
- Rational Zero Test Applications

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**Complete the Review**

*Answer Key is posted.*

**STUDY!!!!!!!**

- socrative will remain open
- Study Book checked Tuesday