Chapter 6- Polynomials and Polynomial Functions
Test Review
Follow all directions! ☺

1. The table shows the number of hybrid cottonwood trees planted in tree farms in Oregon since 1987. Find a cubic function to model the data and use it to estimate the number of cottonwoods planted in 2003.

<table>
<thead>
<tr>
<th>Years since 1987</th>
<th>1</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees planted</td>
<td>0.8</td>
<td>6.4</td>
<td>21.6</td>
<td>51.2</td>
<td>100.0</td>
</tr>
</tbody>
</table>

\[ y = ax^3 + bx^2 + cx + d \]

Let \( x = 1 \) \( \text{trees} \)

2. Classify 2 by degree and by number of terms.

\text{degree 0, Herm}

Constant monomial

3. Write \( y = (x - 6)(x - 4)(x + 2) \) in standard form.

\[ (x-6)(x^2-2x-8) = x^3 - 8x^2 + 4x - 48 \]

4. Find the factored form of \( 2x^3 - 4x^2 - 6x \).

\[ 2x(x^2 - 2x - 3) \]

5. Write a polynomial in standard form with zeros \(-3, -6, \) and \(-1\).

\( (x + 3)(x + 6)(x + 1) \)

6. Find the zeros of \( y = x^5(x - 5)^3(x - 3)^4 \). State the multiplicity of multiple zeros.

\[ x = 0, \text{mult. 2} \quad x = 3, \text{mult. 4} \]

7. Solve \( 8x^3 + 27 = 0 \).

\[ (2x + 3)^3 = -27 \]

8. Factor \( 3c^3 + 375 \).

\[ 3(c^3 + 125) = 3(c^3 + 5^3) \]

9. Find the roots of \( x^2 + 4x^2 + 3x + 12 = 0 \).

Possible rational roots: \( \pm 1, \pm 2, \pm 3, \pm 4, \pm 12, \pm 3, \pm 2, \pm 1 \)

Actual roots: \( x = -4, i\sqrt{3}, -i\sqrt{3} \)

10. For \( 3x^2 - 2x + 6 = 0 \), state the number of complex roots, the possible number of real roots, and the possible rational roots.

\( \frac{2}{2} \)

\[ \pm 1, \pm 2, \pm 3, \pm \frac{1}{3}, \pm \frac{2}{3} \]
11. Divide \((x^2 + 3x - 12) + (x - 3)\) using synthetic division.

\[
\begin{array}{c|cccc}
3 & 1 & 3 & -12 & \\
\hline \\
 & & 3 & 6 & \\
\end{array}
\]

\[x + 6 \quad R. 6\]

13. Use synthetic division and the Remainder Theorem to find \(P(-2)\) if

\[P(x) = x^3 + 4x^2 + 4x + 6\]

\[
\begin{array}{c|cccc}
-2 & 1 & 4 & 4 & 6 \\
\hline \\
 & & 4 & 0 & \\
\end{array}
\]

\[P(-2) = 0\]

14. Solve \(x^2 - 10x + 29 = 0\)

* cannot factor - use quadratic formula

\[a = 1 \quad b = -10 \quad c = 29\]

\[
X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{10 \pm \sqrt{-14}}{2} = \frac{10 \pm 4i}{2}
\]

\[X = 5 \pm 2i\]

15. Solve \(x^4 - 17x^2 + 16 = 0\).

Let \(a = x^2\)

\((a^2 - 17a + 16) (a - 1) (a^2 - 1) = 0\)

\[a = 1, 4, 16, 1\]

\[x = -1, 1, -1, 1\]

16. Use the Rational Root Theorem to determine all possible rational roots of \(5x^3 + 4x^2 + 4x + 5 = 0\). Do NOT find the actual roots.

\[
\begin{array}{c|c|c|c}
\text{fact. of constant} & \text{fact. of coeff.} & \text{leading} \\
\hline \\
5 & \pm 1 & \pm 1 \\
\end{array}
\]

Ms. Woolard is changing the seating chart in her classroom. There are 23 students (and exactly 23 chairs). In particular, Ms. Woolard is only interested in switching around any set of 5 students. How many different seating arrangements can Ms. Woolard create by changing the seats of only 5 students?

- order matters - permutation

\[23 P_5 = 4,037,880\] different arrangements.

17. In how many ways can 12 basketball players be selected from 20 who came to try-out for the team?

* Not for specific positions, but just to be on the team.

\[20 C_{12} = 125,970\] ways

19. Expand \((t - w)^2\).

\[(t - w)^2 = t^2 - 2tw + w^2\]

20. Use Pascal's Triangle to expand \((2x + y)^3\).

\[8x^3 + 12x^2y + 6xy^2 + y^3\]

21. Write a polynomial in standard form with roots \(4\) and \(2 - i\).

\[(x - 4)(x^2 + 4i)\]

\[y = x^3 - 8x^2 + 21x - 20\]