Sec 4.3 Attributes of Cubic Functions

Factored Form: \( f(x) = (2x - 5)(2x + 1)(2x + 7) \)

Standard Form: \( f(x) = 8x^3 + 12x^2 - 66x - 35 \)

Relative maximum –

Relative minimum –

Roots –

End Behavior –

<table>
<thead>
<tr>
<th>Standard Form</th>
<th>Factored Form</th>
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</thead>
<tbody>
<tr>
<td>( f(x) = ax^3 + bx^2 + cx + d )</td>
<td>( f(x) = a(x - r_1)(x - r_2)(x - r_3) )</td>
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</table>

A cubic function is a polynomial function of degree 3 and must have 3 roots. Roots may be real or imaginary and can appear multiple times. **Multiplicity** is how many times a particular number is a root for a given polynomial function. Multiplicity is the **DEGREE** of the factor.

\[
\begin{align*}
  f(x) &= (x - 4)^2(x + 1) \\
  m_2 & \quad \quad m_1
\end{align*}
\]

\[
\begin{align*}
  f(x) &= (x - 5)^3 \\
  m_3
\end{align*}
\]

Multiplicity tells you about the behavior of your graph at the x-intercepts.

**Multiplicity of 1:**

**Multiplicity of even #s:**

**Multiplicity of odd #s > 1:**
Graph the following equations in the calculator, and then sketch the graph. Label the roots of each graph and what behavior is happening at each root.

a. \( y = (x + 2)^2(x - 3) \)  
b. \( y = (x - 3)^3 \)  
c. \( y = -(x + 3)^1(x - 3)^2 \)

Ex. 1: Graph \( f(x) = (x + 2)(3x - 2)(4 + x) \).

Sketch: ________________________________

Roots: ________________________________

Multiplicity of each: ____________________

Standard Form: _______________________

End Behavior: ____________________
Ex. 2: Graph \( f(x) = -2x(x - 3)^2 \).

Sketch:

Roots: ______________________

Multiplicity of each: ______________

Standard Form: ______________________

End Behavior: ___________

EX 3: Graph \( f(x) = x(x + 2)^2 \).

Sketch:

Roots: ______________________

Multiplicity of each: ______________

Standard Form: ______________________

End Behavior: ___________

EX 4: Graph \( f(x) = (6 - x)(2x^2 - 3x + 1) \).

Sketch:

Roots: ______________________

Multiplicity of each: ______________

Standard Form: ______________________

End Behavior: ___________