Section 3.3 Extra Practice

1. What is the corresponding binomial factor of a polynomial \( P(x) \) given the value of the zero?
   a) \( P(6) = 0 \)
   b) \( P(-7) = 0 \)
   c) \( P(2) = 0 \)
   d) \( P(-5) = 0 \)

2. Determine whether \( x - 1 \) is a factor of each polynomial.
   a) \(-4x^3 - 3x^2 + 2x^2 - x + 5\)
   b) \(7x^5 + 5x^4 + 23x^2 + 8\)
   c) \(2x^4 - 3x^3 - 5x^2 + 6x - 1\)
   d) \(2x^3 + 5x^2 - 7\)

3. State whether each polynomial has \( x + 2 \) as a factor.
   a) \(-3x^3 + 2x^2 + 10x + 5\)
   b) \(5x^2 + 6x - 8\)
   c) \(2x^4 - 3x^3 - 5x^2\)
   d) \(3x^3 - 12x - 2\)

4. What are the possible integral zeros of each polynomial?
   a) \( P(n) = n^3 - 2n^2 - 5n + 12 \)
   b) \( P(p) = p^4 - 3p^3 - p^2 + 7p - 6 \)
   c) \( P(z) = z^4 + 4z^3 + 3z^2 + 8z - 25 \)
   d) \( P(y) = y^4 - 11y^3 - 2y^2 + 2y + 10 \)

5. The factors of a polynomial are \( x + 3, x - 4, \) and \( x + 1 \). Describe how the zeros of the polynomial expression could be used to determine the zeros of the corresponding function.

6. Factor completely.
   a) \( x^3 + 2x^2 - 13x + 10 \)
   b) \( x^4 - 7x^3 + 3x^2 + 63x - 108 \)
   c) \( x^3 - x^2 - 26x - 24 \)
   d) \( x^4 - 26x^2 + 25 \)

7. Factor completely.
   a) \( x^3 + x^2 - 16x - 16 \)
   b) \( x^3 - 2x^2 - 6x - 8 \)
   c) \( k^3 + 6k^2 - 7k - 60 \)
   d) \( x^3 - 27x + 10 \)

8. Factor completely.
   a) \( x^4 + 4x^3 - 7x^2 - 34x - 24 \)
   b) \( x^6 + 3x^4 - 5x^3 - 15x^2 + 4x + 12 \)

9. Determine the value(s) of \( k \) so that the binomial is a factor of the polynomial.
   a) \( x^2 - 8x - 20, x + k \)
   b) \( x^2 - 3x - k, x - 7 \)

10. Each polynomial has a factor of \( x - 3 \). What is the value of \( k \) in each case?
    a) \( kx^3 - 10x^2 + 2x + 3 \)
    b) \( 4x^4 - 3x^3 - 2x^2 + kx - 9 \)
Section 3.4 Extra Practice

1. Solve.
   a) \((x + 5)(x + 2)(x - 3)(x - 6) = 0\)
   b) \(x^3 - 27 = 0\)
   c) \((3x + 1)(x - 4)(x - 7) = 0\)
   d) \(x(x + 4)^3(x + 2)^2 = 0\)

2. For this graph, identify the following:

   \[\text{y} = x^3\]

   a) the zeros
   b) the intervals where the function is positive
   c) the intervals where the function is negative

3. For the graph of this polynomial function, determine the following:

   \[\text{y} = x^4\]

   a) the least possible degree
   b) the sign of the leading coefficient
   c) the x-intercepts and the factors of the function
   d) the intervals where the function is positive and the intervals where it is negative

4. The graph of \(y = x^3\) is transformed to obtain the graph of \(y = -2(4(x + 1))^3 - 5\). Copy and complete the table.

<table>
<thead>
<tr>
<th>(y = x^3)</th>
<th>(y = (4x)^3)</th>
<th>(y = -2(4x)^3)</th>
<th>(y = -2(4(x + 1))^3 - 5)</th>
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<tbody>
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<td>((-1, -1))</td>
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5. The graph of \(y = x^4\) is transformed to obtain the graph of \(\frac{1}{4}\left(\frac{1}{2} (x - 9)\right)^4 + 3\). Copy and complete the table.

<table>
<thead>
<tr>
<th>(y = x^4)</th>
<th>(\left(\frac{1}{2} x\right)^4)</th>
<th>(\frac{1}{4}\left(\frac{1}{2} x\right)^4)</th>
<th>(\frac{1}{4}\left(\frac{1}{2} (x - 9)\right)^4 + 3)</th>
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6. For the graph of this polynomial function, determine the following:

   a) the least possible degree  
   b) the sign of the leading coefficient  
   c) the $x$-intercepts and the factors of the function  
   d) the intervals where the function is positive and the intervals where it is negative

7. Without using a graphing calculator, determine the following for $y = x^3 + 4x^2 - x - 4$:
   a) the zeros of the function  
   b) the degree and end behaviour of the function  
   c) the $y$-intercept  
   d) the intervals where the function is positive and the intervals where it is negative
8. Sketch a graph of each function without using technology. Label all intercepts.
   a) \( y = x^3 - 4x^2 - 5x \)
   b) \( f(x) = -x^4 + 19x^2 + 6x - 72 \)
   c) \( g(x) = x^5 - 14x^4 + 69x^3 - 140x^2 + 100x \)

9. Determine the equation with least degree for each polynomial function.
   a) a cubic function with zeros
      3 (multiplicity 2) and \(-1\), and
      \( y \)-intercept = 18
   b) a quintic function with zeros
      \(-2\) (multiplicity 3) and 4 (multiplicity 2),
      and \( y \)-intercept = \(-32\)
   c) a quartic function with zeros
      \(-1\) (multiplicity 2) and 5 (multiplicity 2),
      and \( y \)-intercept = \(-10\)

10. Determine three consecutive integers with a product of \(-504\).

11. A toothpaste box has square ends. The length of the box is 12 cm greater than the width. The volume is 135 cm\(^3\). What are the dimensions of the box?

12. The dimensions of a rectangular prism are 10 cm by 10 cm by 5 cm. When each dimension is increased by the same length, the new volume is 1008 cm\(^3\). What are the dimensions of the new prism?