Unit 3 & 4 Review Questions

1. Factor each of the following:
   a) \(2x^2 - 2x - 12\)
   b) \(x^3 - 4x\)
   c) \(x^3 + 2x^2 + 2x + 4\)

2. Solve for \(x\) by factoring: \(4x^2 - 20x - 5 = -2x^2 + 9x\)

3. Solve for \(x\) using completing the square and express the roots in simplest \(a+bi\) form:
   \(3x^2 - 12x = -21\)

4. Solve for \(x\) by using the quadratic formula and express the roots in simplest \(a+bi\) form:
   \(3x^2 - 6x = -4\)

5. Perform the indicated operations and express your answer in simplest \(a+bi\) form.
   a) \((6 + \sqrt{-49}) + (3 + \sqrt{-64})\)
   b) \((-1 + 2\sqrt{-12}) - (8 + 5\sqrt{-48})\)

6. Perform the following complex calculation. Express your answer in simplest \(a+bi\) form.
   \(7(3x - 5i) + (4x - 2i)(-6x + 7i)\)
Unit 4 Sample Questions

1. For the polynomial function graphed below, which of the following intervals given is the function strictly increasing?

(1) \( x > 0 \)  
(2) \( x < 1 \)  
(3) \( 0 < x < 2 \)  
(4) \( x > 1 \)

2. What is the value of \( k \) such that \((2x^3 - kx^2 + x - 6)/(x - 2)\) has a remainder of zero?

(1) -2  
(2) 2  
(3) 3  
(4) -6

3. The function \( f(x) \) is an odd function with \( f(3) = 7 \) and \( f(9) = 11 \). Then \( f(-3) \) must be equal to

(1) 7  
(2) -7  
(3) 3  
(4) -11

4. Which of the following is a factor of the cubic expression \( x^3 - 3x^2 - 64x - 60 \)?

(1) \((x - 5)\)  
(2) \((x + 10)\)  
(3) \((x + 1)\)  
(4) \((x - 12)\)
5. Which graph has the following characteristics?

- 4th degree
- As \( x \to -\infty \), \( f(x) \to -\infty \)
- As \( x \to \infty \), \( f(x) \to -\infty \)

6. Divide: \((2x^2 + 2x + 5) \div (x + 2)\)

1) \( 2x - 2 + \frac{9}{x+2} \)  
2) \( 2x + 6 + \frac{17}{x+2} \)  
3) \( 2x + 7 \)  
4) \( -4x + 10 - \frac{15}{x+2} \)

7. Algebraically determine whether the function \( p(x) = x^4 + 3x^2 - 12 \) is even, odd, or neither.

8. Find the third term in the expansion of \((x - 2y)^4\)
9. Given: \( p(x) = x^3 + 3x^2 - 4x - 12 \), find all values of \( x \) that satisfy the equation \( p(x) = 0 \). (Only an algebraic solution will be acceptable.)

10. The graph of a polynomial is shown below.

What is the degree of the this polynomial function? ____________

As \( x \to \infty \), then \( f(x) \to \) ____________.

As \( x \to -\infty \), then \( f(x) \to \) ____________.

Is this function even, odd, or neither? Why? ________________

11. Find an equation of the following polynomial function.