

### Part A) Knowledge and Understanding

#### Multiple Choice

Identify the choice that best completes the statement or answers the question.

- What is the remainder when  $x^4 + 2x^2 - 3x + 7$  is divided by  $x + 2$ ?
  - 25
  - 13
  - 37
  - 9
- If  $6x^4 - 2x^3 - 21x^2 + 7x + 8$  is divided by  $3x - 1$  to give a quotient of  $2x^3 - 7x$  and a remainder of 8, then which of the following is true?
  - $(6x^4 - 2x^3 - 21x^2 + 7x + 8)/(3x - 1) = 2x^3 - 7x + 8/(3x - 1)$
  - $6x^4 - 2x^3 - 21x^2 + 7x + 8 = (3x - 1)(2x^3 - 7x) + 8$
  - $x \neq 1/3$
  - all of the above
- Which of the following binomials is a factor of  $8x^3 - 4x^2 - 2x + 1$ ?
  - $x - 1$
  - $x + 2$
  - $2x + 1$
  - $5x + 1$
- Determine the value of  $k$  so that  $3x - 1$  is a factor of  $3x^3 + 8x^2 + kx - 2$ .
  - $k = 3$
  - $k = -3$
  - $k = 1$
  - $k = -1$
- Which of the following is the fully factored form of  $x^3 - 6x^2 - 6x - 7$ ?
  - $(x - 7)(x + 1)^2$
  - $(x - 7)(x^2 + x + 1)$
  - $(x - 7)(x + 1)(x - 1)$
  - $(x - 6)(x + 1)(x - 1)$
- Which of the following is the factored form of  $x^4 - 2x^2 - 3$ ?
  - $(x - 1)(x + 1)(x - 3)$
  - $(x^2 - 1)(x + 3)$
  - $(x^2 + 1)(x^2 - 3)$
  - none of the above
- One root of the equation  $2x^4 + x^3 + 4x + 2 = 0$  is
  - 2
  - $-1/2$
  - 2
  - $1/2$
- Which of the following is a quartic polynomial function with zeros 1 (order 2), 2, and -5?
  - $y = (x - 1)^2(x - 2)(x + 5)$
  - $y = -(5/8)(x - 1)^2(x - 2)(x + 5)$
  - $y = -0.0034(x - 1)^2(x - 2)(x + 5)$
  - all of the above

**True/False**

Indicate whether the statement is true or false (T or F).

- \_\_\_\_\_ 9. When performing long division of a polynomial by a linear binomial, the degree of the remainder is always smaller than the degree of the divisor.
- \_\_\_\_\_ 10. If  $P(-3) = 0$  for a polynomial  $P(x)$ , then  $x + 3$  is a factor of  $P(x)$ .
- \_\_\_\_\_ 11. For a polynomial equation  $P(x) = 0$ , if  $P(x)$  is not factorable, then  $P(x) = 0$  has no real roots.
- \_\_\_\_\_ 12. All cubic polynomial inequalities have three solutions.

**Short Answer**

Solve the following inequality and show your solution on a number line.

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$$3x(2x - 1) - 8 > 2x + 6(x^2 + 2)$$

**Part B) Applications**

1. Divide  $3x^2 + 2x^3 - x + 5$  by  $2x - 3$ .

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2. Solve:  $3x^4 + 5x^3 - 13x^2 - x + 6 = 0$

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3. Fully factor the following:

a)  $125x^9 - (1/27)y^{15}$

b)  $6x^3 - 5x^2 - 6x + 5$

/6

4. Dividing  $(2x^3 + 4x^2 - kx + 5) \div (x + 3)$  and  $(6y^3 - 3y^2 + 2y + 7) \div (2y - 1)$  leads to the same remainder. Find the value of  $k$ . /3

5. Solve the following polynomial inequality.

$$9x^3 - 16x \leq 0$$

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### Part C) Communication

Complete each statement.

1. If  $x(4x - 3)(x + 1) = 0$ , then the solutions for  $x$  are \_\_\_\_\_. /1
  
2. When performing long division of a polynomial by a linear binomial, the degree of the remainder is always \_\_\_\_\_ than the degree of the divisor. /1
  
3. Write the general form of the quotient division statement. /1
  
  
  
  
  
  
  
  
  
  
4. Sketch  $f(x)$  if  $f(x) > 0$  when  $-3 < x < -1$ ,  $2 < x < 4$ , and  $x > 6$  /2

*Part D) Thinking, Inquiry and Problem Solving*

The polynomial function  $f(x) = ax^4 - 3x^3 - 63x^2 + 152x - b$  has one of its zeros at  $x = 5$  and passes through the point  $(-2, -560)$ .

Use the given information to determine the values of  $a$  and  $b$ .

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