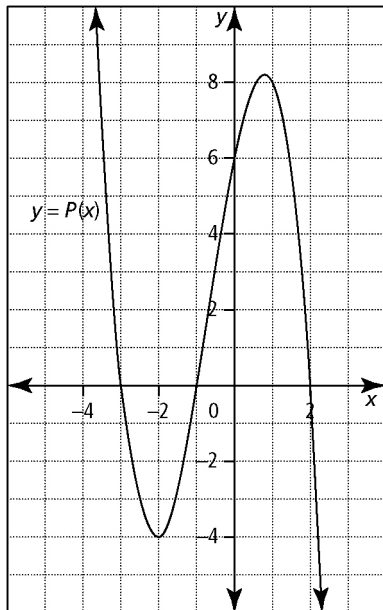


# Chapter 3 Test

## Multiple Choice

For #1 to #4, choose the best answer.

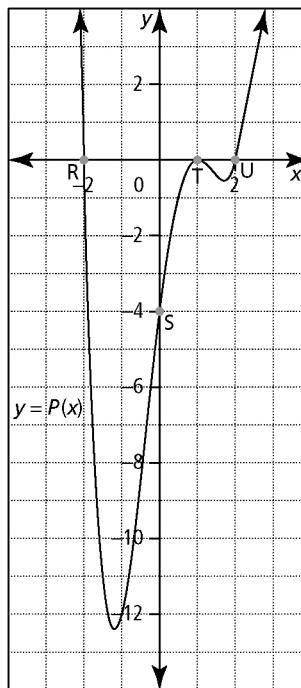
1. The partial graph of a third-degree polynomial function of the form  $P(x) = ax^3 + bx^2 + cx + d$  is shown.



Which statement about the values of  $a$  and  $d$  is correct?

- A  $a > 0$  and  $d > 0$
  - B  $a > 0$  and  $d < 0$
  - C  $a < 0$  and  $d > 0$
  - D  $a < 0$  and  $d < 0$
2. Which polynomial function has zeros of  $-3$ ,  $1$ , and  $2$ , and  $y$ -intercept  $= -6$ ?
- A  $(x + 3)(x - 1)^2(x - 2)$
  - B  $(x - 3)(x - 1)(x - 2)$
  - C  $(x + 3)(x - 1)(x - 2)$
  - D  $(x + 3)(x - 1)(x - 2)^2$

3. The partial graph of the function  $P(x) = ax^4 + bx^3 + cx^2 + dx + e$  is shown.



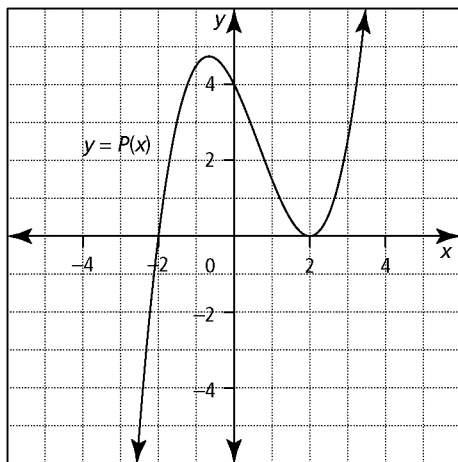
Consider the following statements.

- i) The  $y$ -intercept at point S is equal to the constant  $e$ .
  - ii)  $a > 0$
  - iii) The multiplicity of the zero at point T is 2.
- A Only statement i) is true.
  - B Only statement ii) is true.
  - C Only statement iii) is true.
  - D All three statements are true.
4. The graph of the function  $f(x) = (x + 4)(x - 2)(x + 6)$  is transformed by a horizontal stretch by a factor of 2. Which of these statements is true?
- A The new zeros of the function are  $-12$ ,  $-8$ ,  $4$ .
  - B The new zeros of the function are  $-3$ ,  $-2$ ,  $1$ .
  - C The new  $y$ -intercept is  $-96$ .
  - D The new  $y$ -intercept is  $-24$ .



**Short Answer**

5. When  $f(x) = x^3 - 7x^2 + kx + 17$  is divided by  $x - 5$ , the remainder is 2. Determine the value of  $k$ .
6. The partial graph of the third-degree polynomial function  $P(x) = a(x - b)(x - c)(x - d)$  is shown. Determine the value of  $a$ .



7. If  $P(x) = x^4 + bx^2 + c$ ,  $P(1) = 9$ , and  $P(3) = 25$ , what are the values of  $b$  and  $c$ ?
8. The volume of a box is represented by the function  $V(x) = x^3 + 6x^2 + 11x + 6$ . The height of the box is  $x + 2$ . If the area of the base is  $24 \text{ cm}^2$ , determine the height of the box.
9. Determine the largest possible solution to the polynomial equation  $x^3 - 10x^2 + 33x = 36$ .

**Extended Response**

10. Perform the division  $(x^3 - 5x^2 - x + 5) \div (x - 2)$ . Express the result in the form  $\frac{P(x)}{x - a} = Q(x) + \frac{R}{x - a}$ .
11. Factor  $x^4 - 13x^2 - 12x$  completely.
12. The graph of  $y = x^3 + x^2 + cx - 4$  has an  $x$ -intercept of  $-1$ . Determine the value of  $c$  and the remaining  $x$ -intercepts.
13. Graph the function  $f(x) = x^3 + x^2 - 10x + 8$ . State the  $x$ -intercepts,  $y$ -intercepts, and the zeros of the function. Determine the intervals where the function is positive and the intervals where the function is negative.
14. The graph of the function  $f(x) = x^3$  is translated horizontally to create  $g(x)$ . If the point  $(4, 8)$  is on  $g(x)$ , determine the equation of  $g(x)$ .
15. The function  $f(x) = x^4$  is horizontally stretched by a factor of  $\frac{1}{2}$  about the  $y$ -axis, reflected in the  $x$ -axis, and translated vertically 1 unit up. Explain how the domain and range of  $f(x)$  are changed by the transformation.

