
Chapter 4 Test

1. Knowledge and Understanding (Functions)

Simplify.

(a) $\frac{m^2 - 2m}{m^2 + 5m - 14}$ (b) $\frac{4}{x^2 - x - 12} - \frac{3}{x^2 - 9}$

(c) $\frac{x^2 - 3x - 4}{x^2 + 5x + 6} \times \frac{x^2 - 4}{x^2 - 2x - 3} \div \frac{x^2 - 4x}{(x + 3)^2}$

2. Knowledge and Understanding, Application (Functions)

- (a) State whether each function has a maximum or minimum value and find the coordinates of the vertex.

i. $s(t) = -4.9t^2 + 34.3t - 3$

ii. $f(x) = (x + 4)(x - 3)$

- (b) Research shows that the demand function for a new product is $p(x) = -5x + 18$, where x represents the number of items in thousands and p represents the price in dollars. The cost function is $C(x) = 2x + 9$.

- i. Obtain the revenue and profit functions and determine the x -value that maximizes profits.

- ii. Find the break-even quantities and graph the profit function.

3. Knowledge and Understanding, Communication (Functions)

- (a) Show that the equation $10(x^2 - 5x + 5) = x^2 - 8x + 1$ has one double root.

- (b) Find the value of k if the function $f(x) = x^2 - (k + 2)x + 2k + 4$ has no zeros.

4. Knowledge and Understanding (Functions)

- (a) One root of a quadratic equation is $3 - i$. State the other root and write the equation in the form $ax^2 + bx + c = 0$.

- (b) Solve $4x^2 - 4x + 3 = 0$ for x , where x is a complex number.

5. Knowledge and Understanding (Functions and Relations)

If $z = 2 - i$ and $w = 2 + 3i$, express $zw - \frac{z}{w}$ in the form $a + bi$.

6. Application, Communication (Functions)

- (a) Pressure and volume in an internal combustion chamber are inversely related. The pressure is 20.5 N/cm^3 when the volume is 250 cm^3 . What is the volume if the pressure is 14 N/cm^3 ? Write an equation for the relationship and graph it.

- (b) For the function $f(x) = 3x - 2$, graph $f(x)$, $\frac{1}{f(x)}$, and $f^{-1}(x)$ on the same axes. State the domain and range of each function.

7. Application (Functions)

Sean bought a case of hockey shirts for \$504. He kept three for himself and sold the rest for \$630, making a profit of \$9 on each shirt. How many shirts were in the case?

8. Thinking, Inquiry, Problem Solving, Communication (Functions)

(a) If $p = x^2 - x + 1$ and $q = x^2 + x + 1$, show that $p^2 - 2pq + q^2 = 4x^2$.

(b) Determine the degree of the resulting polynomial.

i. if any two polynomials of degree 3 are multiplied together

ii. if a quadratic expression and a polynomial of degree 5 are multiplied together

Use examples in your explanation and develop a rule to determine the degree of a product of polynomials.

9. Thinking, Inquiry, Problem Solving (Functions)

Find the coordinates of point P that maximize the area of the rectangle in the diagram.

