BEA/Huson/ Algebra 2
15 December 2023

Polynomials and Rational Functions: Mid-Unit Assessment

A. APR. 3 Zeros
algebraically

You may use a four-function or scientific calculator, but not a graphing calculator.

1. Which expression is equivalent to $2(3x + 4)(x - 1)(x - 3)$?

   A. $6x^3 - 16x^2 - 14x + 24$

   B. $6x^3 - 4x^2 - 34x - 24$

   C. $3x^3 - 8x^2 - 7x + 12$

   D. $6x^3 + 20x^2 - 2x - 24$

2. The polynomial p is a function of x. The graph of p has four zeros at -4, $-\frac{2}{3}$, 0, and 9.

   Select all the expressions that could represent p.

   A. $3x(x - 4)\left(x + \frac{2}{3}\right)(x + 9)$

   B. $-x(x + 4)\left(x + \frac{2}{3}\right)(x - 9)$

   C. $3x(x + 4)(3x + 2)(x - 9)$

   D. $3x(x + 4)(2x - 3)(x - 9)$

   E. $-3x(x + 4)(3x + 2)(x - 9)^2$

3. For the pair of polynomials given, select **all** the points of intersection of their graphs.

$g(x) = (x + 7)(x - 5)$

A.REI.4 *quadratics*

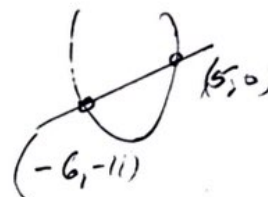$h(x) = x - 5$

   A. (-8, -13)

   B. (-7, 0)

   C. (-5, -10)
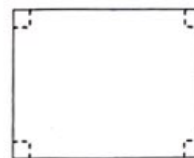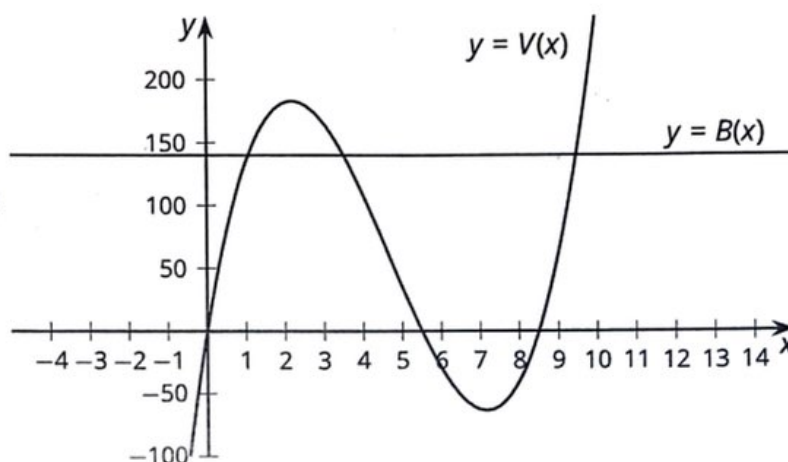
   D. (-6, -11)

   E. (5, 0)

(5, 0)

(-6, -11)

4. Elena is making an open-top box by cutting squares out of the corners of a piece of paper that is 11 inches wide and 17 inches long, and then folding up the sides. If the side lengths of her square cutouts are x inches, then the volume of the box is given by
$$V(x) = x(11 - 2x)(17 - 2x).$$

F.IF.7c GRAPH polynomials

Elena graphs the volume of the box along with the function $B(x) = 140$.

a. What is a reasonable domain for $V(x)$?

$$0 \le x < 5\tfrac{1}{2}$$

b. Approximately which value of x will give her a box with the greatest volume?

$$x \approx 2$$

c. For approximately which values of x is the volume of the box increasing?

$$0 < x < 2$$

d. What do the points of intersection of these two graphs represent?

When the box's Volume is 140 in³

5. Let P be a polynomial function, and $P(x) = x^4 - dx^3 + 8x^2 - 14x + 16$. If $(x - 2)$ is $x = 2 \quad y = 0$
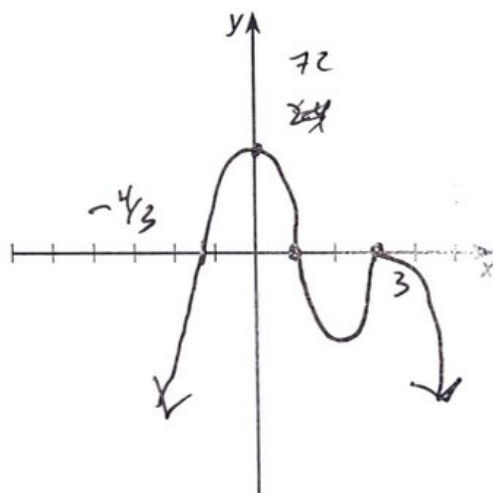   a factor of the polynomial, what is the value of d? Explain or show how you know.

$$P(2) = 2^4 - d \, 2^3 + 8(2^2) - 14(2) + 16 = 0$$
$$16 - 8d + 32 - 28 + 16 = 0$$
$$36 - 8d = 0$$
$$d = 4\tfrac{1}{2}$$

6. Let g be a polynomial function of x where $g(x) = 2x^3 + 5x^2 - 28x - 15$. If $(x - 3)$ is
   a factor of g, write an equation for g as the product of linear factors.

$$g(x) = 2(x+5)\left(x + \tfrac{1}{2}\right)(x-3)$$
$$\text{or}$$
$$= (x+5)(2x+1)(x-3)$$
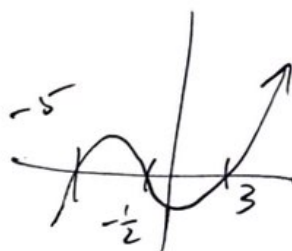
7. Let $g(x) = -2(3x + 4)(x - 1)(x - 3)^2$ be a polynomial function.

a. Sketch a graph of the polynomial.

b. Name all horizontal and
   vertical intercepts of the graph.

$$\left(-\tfrac{4}{3}, 0\right), \ (1, 0), \ (3, 0)$$
$$(0, 72)$$

c. State the end behavior of g.

$$x \to +\infty \quad y \to -\infty$$
$$x \to -\infty \quad y \to +\infty$$