Exam 3

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Determine whether the graph of the parabola opens upward or downward and determine the range.

1) $f(x) = -4(x - 2)^2 - 7$ 1) _____

A) Downward
Range: $(-\infty, -7]$

B) Upward
Range: $[-7, \infty)$

C) Downward
Range: $(-\infty, 2]$

D) Upward
Range: $[2, \infty)$

Identify the vertex and determine the minimum or maximum value of the function.

2) $f(x) = -(x - 3)^2 + 4$ 2) _____

A) Vertex: (3, 4)
Maximum: 4

B) Vertex: (3, -4)
Minimum: -4

C) Vertex: (3, -4)
Maximum: -4

D) Vertex: (3, 4)
Minimum: 4

Determine the *x*- and *y*-intercepts for the given function.

3) $f(x) = -2(x + 3)^2 - 8$ 3) _____

A) *x*-intercept: (-3, 0)
y-intercept: (0, 8)

B) *x*-intercept: none
y-intercept: (0, -26)

C) *x*-intercepts: (-5, 0) and (-1, 0)
y-intercept: (0, -26)

D) *x*-intercept: (-3, 0)
y-intercept: (0, -8)

Find the vertex.

4) $f(x) = -3(x - 3)^2 + 6$ 4) _____

A) (6, 3) B) (3, 6) C) (-3, 6) D) (6, -3)

Find the vertex of the parabola.

5) $f(x) = x^2 + 8x - 9$ 5) _____

A) (8, -9) B) (-4, -25) C) $\left(-4, \frac{11}{4}\right)$ D) (-8, 9)

Identify the vertex, axis of symmetry, and intercepts for the graph of the function.

6) $g(x) = x^2 - 4x - 5$ 6) _____

A) Vertex at (2, -9); axis: $y = -9$; x-intercepts: none; y-intercept: (-1, 0)

B) Vertex at (2, -9); axis: $x = 2$; x-intercepts: (-1, 0) and (5, 0); y-intercept: (0, -5)

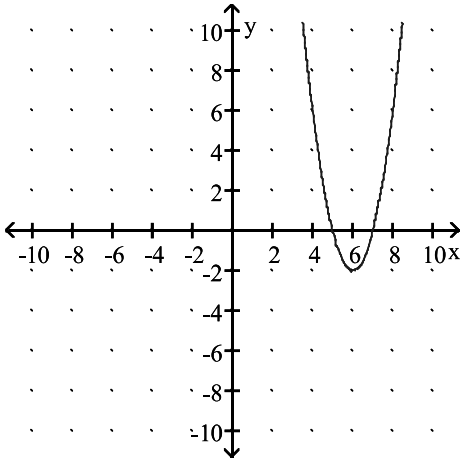
C) Vertex at (-2, 7); axis: $x = -2$; x-intercepts: none; y-intercept: (-1, 0)

D) Vertex at (-2, 7); axis: $y = 7$; x-intercepts: (-1, 0) and (5, 0); y-intercept: (0, -5)

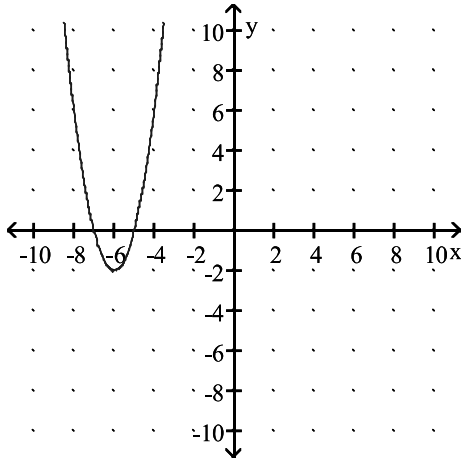
Sketch the function and determine the axis of symmetry.

7) $f(x) = 2(x + 2)^2 + 6$ 7) _____

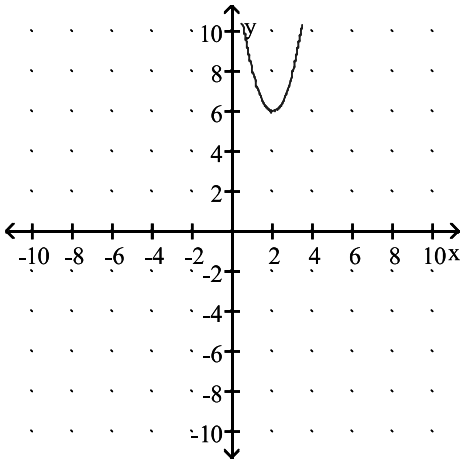
A) Axis of symmetry: $x = 6$



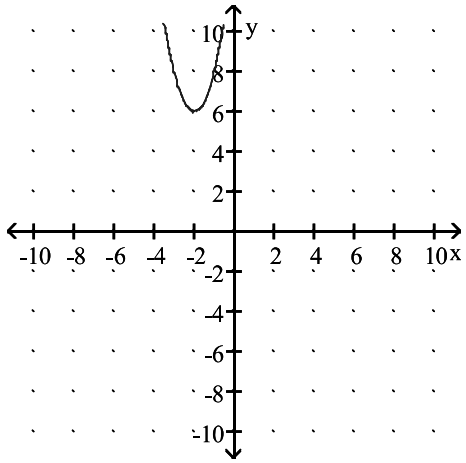
B) Axis of symmetry: $x = -6$



C) Axis of symmetry: $x = 2$



D) Axis of symmetry: $x = -2$



Write the domain and range of the function in interval notation.

8) $f(x) = x^2 + 4x + 5$ 8) _____

A) Domain: $(0, \infty)$
Range: $(-\infty, 1]$

B) Domain: $(-\infty, \infty)$
Range: $[5, \infty)$

C) Domain: $(-\infty, \infty)$
Range: $[1, \infty)$

D) Domain: $(-\infty, \infty)$
Range: $(-\infty, 5]$

Determine the x- and y-intercepts for the given function.

9) $f(x) = 3x^2 - 18x + 39$ 9) _____

A) x-intercepts: (1, 0) and (5, 0)
y-intercept: (0, 39)

B) x-intercept: (3, 0)
y-intercept: (0, 12)

C) x-intercept: (3, 0)
y-intercept: (0, -12)

D) x-intercept: none
y-intercept: (0, 39)

Find the vertex of the parabola by applying the vertex formula.

10) $f(x) = 3x^2 - 12x - 61$ 10) _____

A) $(-2, -25)$ B) $(-6, -73)$ C) $(2, -73)$ D) $(6, -25)$

Determine the end behavior of the graph of the function.

11) $f(x) = -2x^9 + 9x^8 - 2x^7 - 4$ 11) _____

A) Up left and down right
B) Down left and up right
C) Up left and up right
D) Down left and down right

12) $2(x + 7)(-7x + 5)^3(x + 7)^5$ 12) _____

A) As $x \to -\infty$, $f(x) \to \infty$; As $x \to \infty$, $f(x) \to -\infty$
B) As $x \to -\infty$, $f(x) \to -\infty$; As $x \to \infty$, $f(x) \to -\infty$
C) As $x \to -\infty$, $f(x) \to -\infty$; As $x \to \infty$, $f(x) \to \infty$
D) As $x \to -\infty$, $f(x) \to \infty$; As $x \to \infty$, $f(x) \to \infty$

Find the zeros of the function and state the multiplicities.

13) $f(x) = 5x^6(x - 3)^6(x + 4)^5$ 13) _____

A) 0 (multiplicity 6), -3 (multiplicity 6), 4 (multiplicity 5)
B) 0 (multiplicity 6), 3 (multiplicity 6), -4 (multiplicity 5)
C) -3 (multiplicity 6), 4 (multiplicity 5)
D) 3 (multiplicity 6), -4 (multiplicity 5)

Use long division to divide.

14) $(5x^3 + 21x^2 + 25x + 29) \div (x + 3)$ 14) _____

A) $5x^2 + 6x + 15$

B) $5x^2 + 36x + 561$

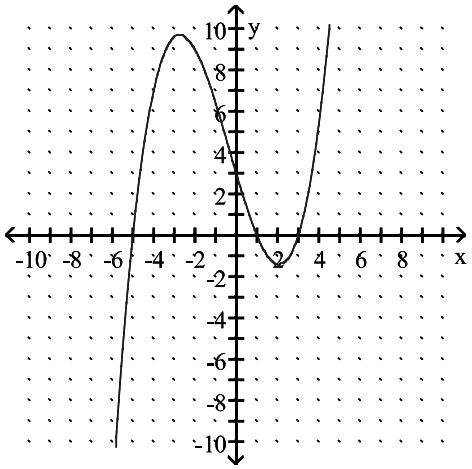
C) $5x^2 + 36x + 133 + \dfrac{428}{x + 3}$

D) $5x^2 + 6x + 7 + \dfrac{8}{x + 3}$

Sketch the function.

15) $g(x) = \frac{1}{5}(x + 3)(x - 5)(x + 1)$ 15) _____

A)



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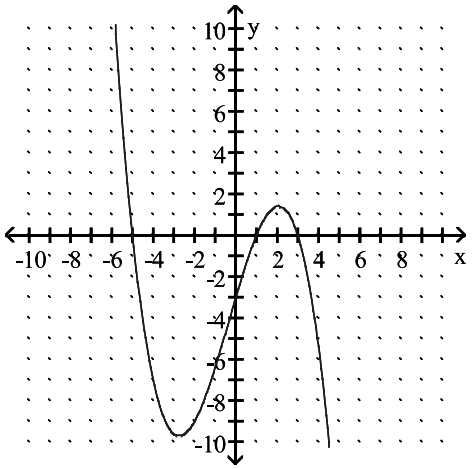

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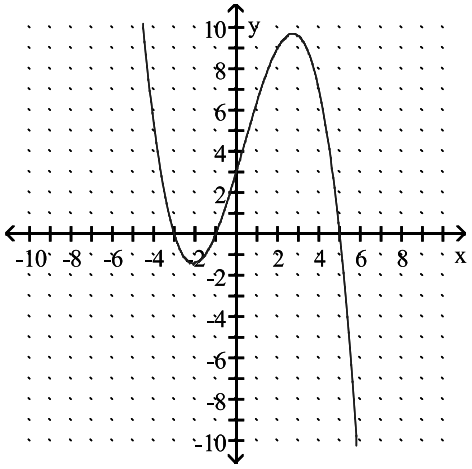

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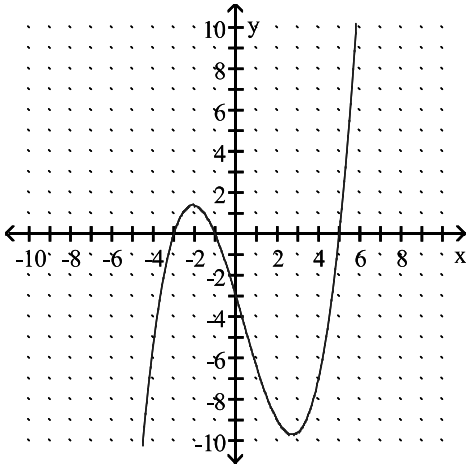


Solve the problem.

16) The following table represents the result of a synthetic division. 16) _____

-1	-7	3	5	-1
		7	-10	5
	-7	10	-5	4

Use x as the variable. Identify the quotient.

A) $x + 1$

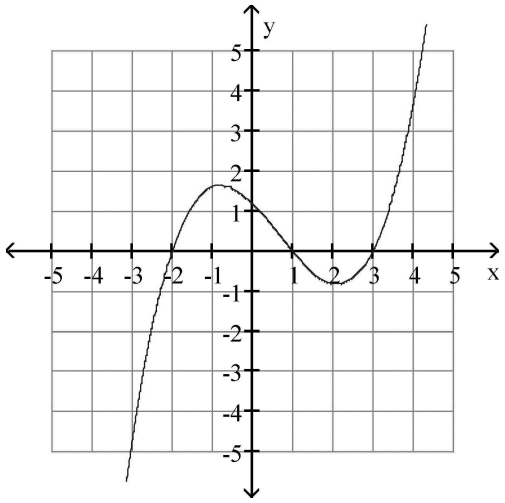
B) $x - 1$

C) $-7x^2 + 10x - 5$

D) $-7x^3 + 3x^2 + 5x - 1$

Determine if the graph can represent a polynomial function. If so, assume the end behavior and all turning points are represented on the graph.

17) 17) _____



a. Determine the minimum degree of the polynomial based on the number of turning points.

b. Determine whether the leading coefficient is positive or negative based on the end behavior and whether the degree of the polynomial is odd or even.

c. Approximate the real zeros of the function, and determine if their multiplicity is odd or even.

A) **a.** Minimum degree 3
b. Leading coefficient positive degree odd
c. -2, 1, and 3 (each with odd multiplicity)

B) **a.** Minimum degree 3
b. Leading coefficient negative degree odd
c. -2 (odd multiplicity), 1 (even multiplicity), 3 (even multiplicity)

C) **a.** Minimum degree 2
b. Leading coefficient negative degree even
c. -2 (odd multiplicity), 1 (even multiplicity), 3 (even multiplicity)

D) Not a polynomial function.

Use synthetic division to divide the polynomials.

18) $(s^2 + 11s + 28) \div (s + 7)$ 18) _____

A) $s + 4$ B) $s - 4$ C) $s - 4 - \frac{8}{s+7}$ D) $s - 4 + \frac{8}{s+7}$

Use the remainder theorem to evaluate the polynomial for the given value of x.

19) $f(x) = 3x^4 + 8x^3 + 37x^2 - 83x + 4$; $f(-3)$ 19) _____

A) 580 B) 613 C) -547 D) 547

Use the remainder theorem to determine if the given number c is a zero of the polynomial.

20) $x^4 + 4x^3 + 7x^2 + 4x - 4; \quad c = 4$ 20) _____

A) No B) Yes

Use the factor theorem to determine if the given binomial is a factor of $f(x)$.

21) $f(x) = x^4 + 3x^3 - 6x^2 - 4x - 8; \quad x - 2$ 21) _____

A) No B) Yes

Solve the problem.

22) Factor $f(x) = 5x^3 + 4x^2 - 151x + 30$ given that 5 is a zero. 22) _____

A) $(x - 5)(5x^2 - 21x - 46)$ B) $(x + 5)(5x + 1)(x + 6)$

C) $(x - 5)(5x - 1)(x + 6)$ D) $(x + 5)(5x^2 - 21x - 46)$

Write a polynomial $f(x)$ that meets the given conditions. Answers may vary.

23) Degree 3 polynomial with zeros -7, 3, and -2 23) _____

A) $f(x) = x^3 + 6x^2 - 41x - 42$ B) $f(x) = x^3 - 6x^2 - 13x + 42$

C) $f(x) = x^3 - 6x^2 - 41x + 42$ D) $f(x) = x^3 + 6x^2 - 13x - 42$

List the possible rational zeros.

24) $f(x) = x^4 - 6x^3 - 4x^2 + 4$ 24) _____

A) $\pm 1, \pm 2, \pm 4$ B) -1, -2, -4 C) $\pm 1, \pm\frac{1}{2}, \pm\frac{1}{4}$ D) 1, 2, 4

Find all the rational zeros.

25) $f(x) = x^4 - 3x^3 + 9x^2 - 21x + 14$ 25) _____

A) $\pm 1, \pm 2, \pm 7$ B) 1, 2 C) $\pm 1, \pm 2$ D) 1, 2, -7

A polynomial $f(x)$ and one of its zeros are given. Find all the zeros.

26) $f(x) = x^4 - 4x^3 + 13x^2 + 28x - 140; \quad 2 + 4i$ is a zero 26) _____

A) $\pm\sqrt{7}, 2 \pm 4i$ B) $\pm 7, \pm 2 + 4i$ C) $\pm\sqrt{7}, \pm 2 + 4i$ D) $\pm 7, 2 \pm 4i$

Determine the number of possible positive and negative real zeros for the given function.

27) $f(x) = 7x^7 - 4x^4 - 9x^3 - 9x^2 + 2x - 9$ 27) _____

A) Positive: 2; Negative: 3 B) Positive: 3; Negative: 2

C) Positive: 3 or 1; Negative: 2 or 0 D) Positive: 2 or 0; Negative: 3 or 1

Write the domain in interval notation.

28) $f(x) = \dfrac{x^2 - 16}{x - 4}$ 28) _____

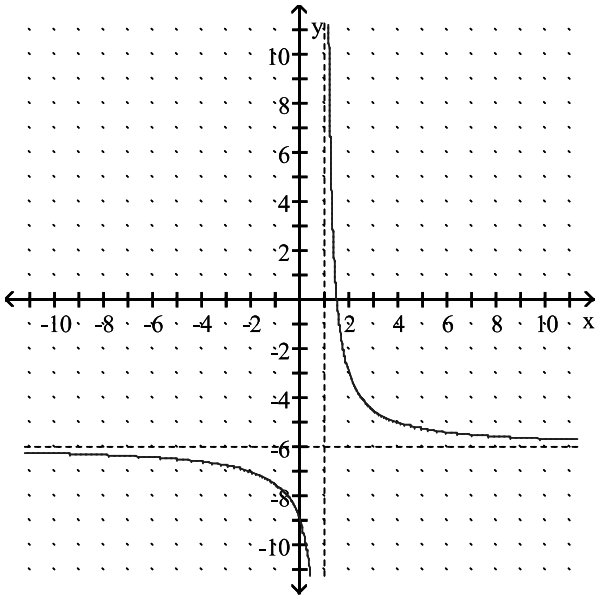
A) $(-\infty, 4) \cup (4, \infty)$ B) $(-\infty, -4) \cup (-4, \infty)$

C) $(-\infty, 4] \cup [4, \infty)$ D) $(-\infty, \infty)$

Refer to the graph of the function and complete the statements.

29) The graph is increasing over the interval(s) _____. 29) _____

The graph is decreasing over the interval(s) _____.



A) $(-\infty, -6) \cup (-6, \infty)$; Never decreasing

B) Never increasing; $(-\infty, -6) \cup (-6, \infty)$

C) Never increasing; $(-\infty, 1) \cup (1, \infty)$

D) $(-\infty, 1) \cup (1, \infty)$; Never decreasing

Determine the vertical asymptote(s) of the graph of the function.

30) $f(x) = \dfrac{x}{x^2 + 16}$ 30) _____

A) $x = 4$ and $x = 0$ B) $x = 4$ and $x = -4$

C) $x = 4$ D) None

Solve the inequality. Write the solution set in interval notation.

31) $\dfrac{x + 2}{x + 4} \leq 0$ 31) _____

A) (2, 4) B) [2, 4) C) (-4, -2] D) (-4, -2)

Identify the asymptotes.

32) $f(x) = \dfrac{3x^2 + 4}{x}$ 32) _____

A) Vertical asymptote: $x = 0$;
Slant asymptote: $y = 3x + 4$

B) Vertical asymptote: $x = 0$;

C) Vertical asymptote: $x = 0$;
Slant asymptote: $y = 3x$

D) Vertical asymptote: $x = 3$;

a. Identify the horizontal asymptote (if any).
b. If the graph of the function has a horizontal asymptote, determine the point where the graph crosses the horizontal asymptote.

33) $f(x) = \dfrac{6x^2 - 9x - 1}{x^2 - 3}$ 33) _____

A) **a.** $y = 0$
b. Graph does not cross $y = 0$.

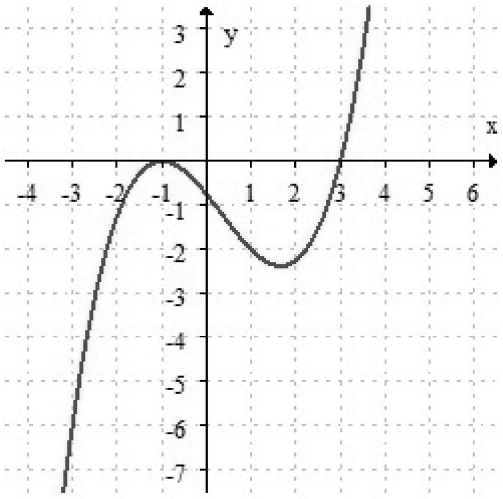
B) **a.** $y = 0$
b. $\left(\dfrac{1}{3}, 0\right)$

C) **a.** $y = 6$
b. $\left(\dfrac{17}{9}, 6\right)$

D) **a.** No horizontal asymptote
b. Not applicable

The graph of $y = f(x)$ is given. Solve the inequality.

34) $f(x) \le 0$ 34) _____



A) $\{-1\} \cup [3, \infty)$

B) $[3, \infty)$

C) $(-\infty, 3]$

D) $(-\infty, -1) \cup (-1, 3]$

Solve the inequality. Write the solution set in interval notation.

35) $-x^2 - 9x - 20 \le 0$ 35) _____

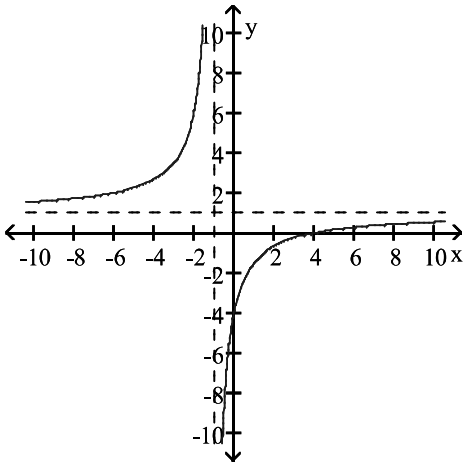
A) $(-\infty, -5] \cup [-4, \infty)$ B) $(-\infty, \infty)$

C) $(-\infty, -4] \cup [5, \infty)$ D) $(-\infty, 4] \cup [5, \infty)$

Graph the function.

36) $f(x) = \dfrac{x - 4}{x - 1}$ 36) _____

A)



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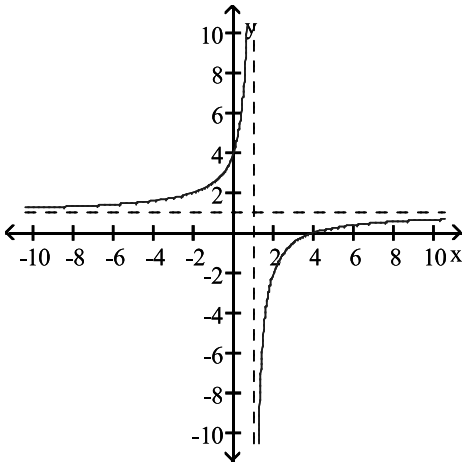

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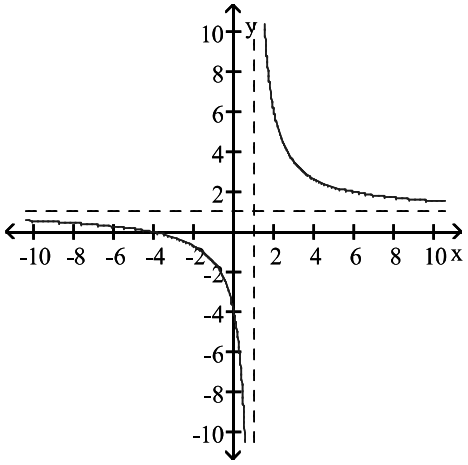

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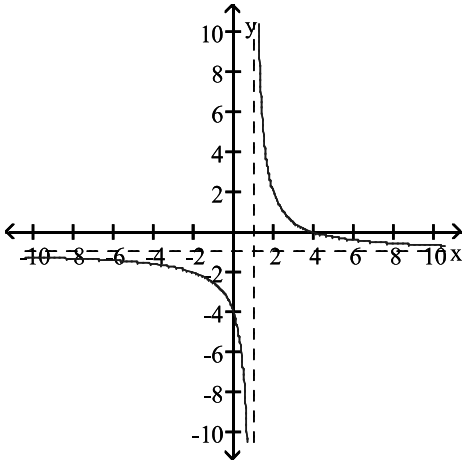

Solve the inequality. Write the solution set in interval notation.

37) $(k - 6)(k - 1)(k + 5) < 0$ 37) _____

A) $(-6, -1) \cup (5, \infty)$ B) $(-5, 1) \cup (6, \infty)$

C) $(-\infty, -6) \cup (-1, 5)$ D) $(-\infty, -5) \cup (1, 6)$

38) $(x - 6)(x - 4) \le -1$ 38) _____

A) [4, 6] B) {5} C) $(-\infty, \infty)$ D) { }