



**MATHEMATICS WORKSHEET OF SELECTED TOPICS FROM
GRADE 10 FOR SUMMER TUTORIAL PROGRAM AT ARSI
UNIVERSITY(ACADEMIC YEAR 2016/2024)**



INSTRUCTION: Choose the best answer from the given alternatives

1. Which one of the following NOT zero of the polynomial function of
 $g(x) = 2x^3 - x^2 - 10x + 5$? A) 2 B) $-\sqrt{5}$ C) $\sqrt{5}$ D) $\frac{1}{2}$
2. When you divide the polynomial $f(x) = 3x^3 + 2x^2 - 19x + 6$ by $x - 1$ the remainder that you will get is: A) 8 B) 24 C) -8 D) 0
3. If $f(x)$ and $d(x)$ are polynomials, such that $d(x) \neq 0$ and degree of $d(x)$ is less than or equal to that of $f(x)$, then after long division of $f(x)$ by $d(x)$ there exist unique polynomials $q(x)$ and $r(x)$ such that $f(x) = d(x)q(x) + r(x)$, when one of the following is correct about
A) $r(x) = 0$ or degree of $r(x) < \text{degree of } d(x)$
B) $r(x) = 0$ or degree of $r(x) \leq \text{degree of } d(x)$
C) Degree of $r(x) \geq \text{degree of } d(x)$
D) Degree of $r(x) < \text{degree of } d(x)$
4. From the following pairs of numbers which one represents the rational zeros of the polynomial $f(x) = x^4 - x^3 - 4x^2 + 4x$?
A) -1 and 3 B) -1 and -3 C) -4 and -1 D) -2 and 2
5. Between which two consecutive integers does $f(x) = x^5 - 2x^3 - 1$ has zero?
A) 0 and 1 B) 1 and 2 C) 2 and 3 D) 3 and 43
6. Let $f(x)$ be polynomial function of degree greater than or equal to one. Which one of the following statements correctly describes the remainder theorem by using $f(x)$?
A) For a real number c if $f(c) = 0$, then $x - c$ divides $f(x)$
B) For a number c if $f(x)$ is divided by $x - c$, then the remainder is $f(c)$
C) For a number c , if $f(x)$ is divided by $x - c$, then the remainder is $f(c) = 0$
D) For a number c , if $f(x)$ is divided by $x - c$, then the remainder is a polynomial $r(x)$ of degree less than or equal to one.
7. Which one of the following is the factor of $x^3 + 5x^2 + 2x - 8$?
A) $x + 1$ B) $x - 2$ C) $x + 4$ D) $x - 3$
8. When dividing, $x^3 + 2x^2 - 5x + 3$ by $x^2 + x - 1$ the quotient and the remainder respectively are:
A) $x + 1$ and $-5x + 2$ B) $x + 1$ and $-3x + 4$
C) $x - 1$ and $-5x - 4$ D) $x + 1$ and $-5x + 4$
9. When $f(x) = x^5 - 6x + 2$ is divided by $x - c$, the remainder is 7. Which of the following is a possible value of c ? A) 1 B) -1 C) 2 D) -2
10. The polynomial function is given by $y = 3x^2 - 3x^4$. Which of the following is NOT true about its graph?
A) It crosses the x -axis two times
B) It has exactly two turning points
C) As x takes large positive values, $|y|$ becomes large
D) It touches the x -axis but does not cross it at $(0, 0)$



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11. Which of the following is NOT true about $f(x) = x(1 - x^2) + 2x^3$?
- A) The leading coefficient is 1 B) The degree of f is 5
C) The constant term is 0 D) The coefficient of x^3 is 2
12. From the following sets, which set contains only all real zeros of $f(x) = 4x^5 - 4x^3 + x$?
- A) $\left\{-\frac{\sqrt{2}}{2}, -\frac{1}{2}, 0, \frac{1}{2}, \frac{\sqrt{2}}{2}\right\}$ B) $\left\{-\frac{\sqrt{2}}{2}, 0, \frac{\sqrt{2}}{2}\right\}$ C) $\left\{0, \frac{\sqrt{2}}{2}\right\}$ D) $\{0\}$
13. Consider the polynomial function $f(x) = ax^4 - b$, where a and b are real numbers. Which one of the following is true about $f(x)$?
- A) The graph of f opens downward for any $b \leq 0$
B) The graph of f opens downward for any $a \leq 0$
C) The graph of f opens upward for any $b > 0$
D) The graph of f opens upward for any $a > 0$
14. Which one of the following is true about the zeros of a function?
- A) The zero of a function f is the functional value of the function at zero
B) If h is a function defined by $h(x) = \frac{x^3-27}{x-3}$, then 3 is the zero of h
C) The functions g and h given by $g(x) = \sqrt{1-x^2} + 1 - x^2$ and $h(x) = \frac{1}{\sqrt{1-x^2}}$ have identical zeros
D) The zeros of a given function f and cf for $c \neq 0$ are identical, if it exist(s)
15. When the polynomial $p(x) = 3x^6 + 5x^4 - 7x^3 + 2kx^2 + 3$ is divided by $x + 1$ the remainder is 4. What is the value of k ?
- A) -5 B) -7 C) 3 D) 6
16. Which of the following is true about the zero(s) of a function $f(x)$?
- A) If $f(a) = 0$, then $x - a$ is a factor for $f(x)$
B) If $f(a) = 0$, then $(x - a)^2$ is a factor for $f(x)$
C) If $f(a) = 0$, then a is not necessarily in the domain
D) If $f(a) = 0$, then $y = a$ is the y -intercept
17. Which of the following function touches but never crosses the x -axis?
- A) $f(x) = 1 - x^3$ B) $f(x) = x^4 - 16$
C) $f(x) = (x^2 - 1)^2$ D) $f(x) = x - x^5$
18. If $x + 2$ and $x + 3$ are factors of the polynomial $p(x)$, then which of the following is not necessarily true?
- A) x is a factor of $p(x + 3)$ B) $x + 1$ is a factor of $p(x - 3)$
C) x is a factor of $p(x - 2)$ D) $x + 4$ is a factor of $p(x + 2)$
19. For which of the following does its graph falls to the left and rises up to the right?
- A) $P(x) = (x - 3)^2(x + 4)^2$ B) $P(x) = (1 - x^2)(x + 2)$
C) $P(x) = (x^2 - 4)(3x^3 + 1)$ D) $P(x) = (-x^2 + 1)(x + 1)^2$



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GRADE 10 FOR SUMMER TUTORIAL PROGRAM AT ARSI
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20. If the zeros of a polynomial $p(x)$ are 0 and -1 , then which of the following are the zeros of $p(x^2 - 6x + 8)$?
- A) 0, -1 and 2 B) 0, -1 , 2 and 4 C) 0, -1 and 3 D) 2, 3 and 4
21. For the polynomial functions $f(x) = x^2 + 2x + 2$ and $g(x) = x^2 - 2x + 2$ the product $(fg)(x)$ is:
- A) $x^4 - 8x^2 + 4$ B) $x^4 - 4x^3 - 8x^2 - 8x + 4$
C) $x^4 - 4x^3 - 6x^2 - 8x + 4$ D) $x^4 + 4$
22. Consider the polynomial function $p(x) = \frac{x^2-1}{3} - (x+1)(x^2-2)$. Which of the following pairs is the leading coefficient and the constant term of $p(x)$ respectively?
- A) $-\frac{2}{3}, \frac{4}{5}$ B) $-\frac{2}{3}, \frac{5}{3}$ C) $-\frac{1}{3}, \frac{7}{5}$ D) $\frac{1}{3}, \frac{5}{3}$
23. When dividing, $x^3 + 2x^2 - 5x + 3$ by $x^2 + x - 1$ the quotient and the remainder respectively are:
- A) $x + 1$ and $-5x + 2$ B) $x + 1$ and $-3x + 4$
C) $x - 1$ and $-5x - 4$ D) $x + 1$ and $-5x + 4$
24. Which of the following is NOT true?
- A) $f(x) = x^3 + x - 3$ has a zero between 0 and 2
B) $f(x) = x^4 - x - 1$ has a zero between -1 and 1
C) $f(x) = x^3 - 2x + 1$ has a zero between -2 and -1
D) $f(x) = (x^3 + 2)(x + 1)$ has a zero between 0 and 1
25. The polynomial function is given by $y = 3x^2 - 3x^4$. Which of the following is NOT true about its graph?
- A) It crosses the x -axis two times
B) It has exactly two turning points
C) As x takes large positive values, $|y|$ becomes large
D) It touches the x -axis but does not cross it at $(0, 0)$
26. Which of the following is NOT true about $f(x) = x(1 - x^2) + 2x^3$?
- A) The leading coefficient is 1 B) The degree of f is 5
C) The constant term is 0 D) The coefficient of x^3 is 2
27. Consider the polynomial function $f(x) = ax^4 - b$, where a and b are real numbers. Which one of the following is true about?
- A) The graph of f opens downward for any $b \leq 0$
B) The graph of f opens downward for any $a \leq 0$
C) The graph of f opens upward for any $b > 0$
D) The graph of f opens upward for any $a > 0$
28. If the polynomial $f(x) = x^4 - 9x^2 + 22$ is divided by $x - 2$, which one of the following are the quotient and remainder respectively?
- A) $x^3 - 2x^2 - 5x + 10$ and 2 B) $x^3 - 2x^2 - 5x + 10$ and -2
C) $x^3 + 2x^2 - 5x - 10$ and -2 D) $x^3 + 2x^2 - 5x - 10$ and 2
29. Which one of the following is true about the zeros of a function?
- A) The zero of a function f is the functional value of the function at zero
B) If h is a function defined by $h(x) = \frac{x^3-27}{x-3}$, then 3 is the zero of h
C) The functions g and h given by $g(x) = \sqrt{1-x^2+1-x^2}$ and $h(x) = \frac{1}{\sqrt{1-x^2}}$ have identical zeros
D) The zeros of a given function f and cf for $c \neq 0$ are identical, if it exist(s)



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UNIVERSITY(ACADEMIC YEAR 2016/2024)**



30. Which of the following is true about the zero(s) of a function $f(x)$?

- A) If $f(a) = 0$, then $x - a$ is a factor for $f(x)$
- B) If $f(a) = 0$, then $(x - a)^2$ is a factor for $f(x)$
- C) If $f(a) = 0$, then a is not necessarily in the domain
- D) If $f(a) = 0$, then $y = a$ is the y - intercept

Unit: 2

31. A function f is said to be an exponential function, where

- A) $f(x) = a^x, a \in R \text{ and } a \neq 1$
- B) $f(x) = a^x, a > 0 \text{ and } a \neq 1$
- C) $f(x) = a^x, a \neq 0$
- D) $f(x) = a^x, a > 0$

32. The solution set of the equation $\log_2(2x + 3) = 4$ is equal to:

- A) $\left\{\frac{19}{2}\right\}$
- B) $\left\{\frac{1}{2}\right\}$
- C) $\left\{\frac{13}{2}\right\}$
- D) $\left\{\frac{5}{2}\right\}$

33. If $\log 3.54 = 0.549$, then the mantissa of $\log 35,400$ is equal to:

- A) 4
- B) 0.051
- C) 4.549
- D) 0.549

34. What is the value of x that makes $2^{2x-1} = 3$ true?

- A) $x = \log 3 - \log 2$
- B) $x = (\log_2 3) + 1$
- C) $\frac{1}{2}(\log_2 3 + 1)$
- D) $\frac{1}{2} + \log_2 3$

35. The world population at the beginning of 1990 was estimated to be 5.3 billion. Assume the population is expected to grow at the rate of 2% per year as shown in the table below

Year	1990	1991	1992	1993	1994
World population	5.3	$5.3e^{(0.02)(1)}$	$5.3e^{(0.02)(2)}$	$5.3e^{(0.02)}$	$5.3e^{(0.02)(4)}$

Find the approximate length of time t required for the world population to double in size of that of 1990?

- A) $\left(\frac{1000}{53}\right)$ years
- B) $50 \ln\left(\frac{10}{53}\right)$ years
- C) 100 years
- D) $50 \ln 2$ years

36. If $\log_a 6 = x$ and $\log_a 3 = y$, where $a > 0$ and $a \neq 1$, then which of the following expression is equal to $\log_a\left(\frac{a}{18}\right)$?

- A) $x + y - 1$
- B) $x + y + 1$
- C) $(1 - x + y)$
- D) $\frac{1}{x+y}$

37. Given $\log 2 = 0.3010$, and $\log 3 = 0.4771$, which one of the value of $\log 12$?

- A) 0.9542
- B) 0.6020
- C) 1.2552
- D) 1.0791

38. If birr 8000 is invested at a rate of 4% compounded yearly, then what is the approximate amount at the end of 2 years?

- A) 8652.80
- B) 9331.20
- C) 8323.20
- D) 9504.80

39. Given that $\log 2.29 = 0.3598$, what are the characteristics of $\log 0.0229$?

- A) -2
- B) 0.3598
- C) -1
- D) 0.6402

40. Which one of the following is considered as an exponential expression?

- A) $\sqrt{x^2 + 6}$
- B) $3x^2 + x + 1$
- C) $3^x + 5^x$
- D) $3^x + 2x + 1$

41. For $a > 0$ and $a \neq 1$, which one of the following is true about $f(x) = a^x$, and $g(x) = \log_a x$?

- A) They have the same range
- B) They have the same domain
- C) Their y - intercepts are the same
- D) The domain of $f(x)$ is the same as the range of $g(x)$



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GRADE 10 FOR SUMMER TUTORIAL PROGRAM AT ARSI
UNIVERSITY(ACADEMIC YEAR 2016/2024)**



42. Let $f(x) = \left(\frac{1}{3}\right)^x$ and $g(x) = \left(\frac{3}{4}\right)^x$. Which of the following is true about these functions?
- A) For $x \geq 0$, the graph of $f(x)$ lies above the graph of $g(x)$
B) For $x < 0$, the graph of $f(x)$ lies above the graph of $g(x)$
C) For $x < 0$, the graph of $f(x)$ and $g(x)$ lies below the line of $y = 1$
D) For $x > 0$, both the graph of $f(x)$ and $g(x)$ lies below the line $y = 1$
43. The simplified form of $\log_{100}(0.01\sqrt{0.01})$ is:
- A) $-\frac{3}{4}$ B) $-\frac{3}{2}$ C) $\frac{3}{2}$ D) $\frac{3}{4}$
44. By using table of logarithm which one of the following is the approximate value of $\sqrt[4]{72300}$? A) 17.4 B) 15.4 C) 16.4 D) 14
45. Which one of the following is true about the graph of the function $f(x) = 1 + \left(\frac{1}{5}\right)^x$?
- A) It intersects the y -axis at $(0, 1)$
B) It is increasing on $[0, \infty)$
C) For $x > 0$, it lies between the lines $y = 1$ and $y = 2$
D) The line $y = 0$ is its asymptote
46. Let $b > 1$ be a real number, $f(x) = \log_b x$ and $g(x) = \log_{\frac{1}{b}} x$ which of the following statements is true?
- A) For $0 < x < 1$, $g(x) > 0$ B) For $0 < x < 1$, $f(x) > 0$
C) For $x > 1$, $g(x) < 1$ D) For $x > 1$, $f(x) < 1$
47. In a laboratory a colony of 100 bacteria grows at a rate of 4% per minute. Which one of the following expressions gives the time (in minute) that takes for the colony of bacteria to reach 110,000?
- A) $\log_{100} 1.04$ B) $\log_{1.04} 10$ C) $\log_{1.04} 100$ D) $\log_{10} 1.4$
48. Which of the following is the solution set of the equation, $\log_3 x - 2 \log_x 9 = 0$?
- A) $\left\{9, \frac{1}{9}\right\}$ B) $\left\{-9, \frac{1}{9}\right\}$ C) $\{-9, 9\}$ D) $\left\{3, \frac{1}{9}\right\}$
49. Which of the following is the mantissa of $\log 0.051$?
- A) $\log 51$ B) $\log 5.1$ C) -3 D) -4
50. The graph of $f(x) = e^x$ and $g(x) = \frac{1}{e^x}$ are symmetric about the line whose equation is:
- A) $y = -x$ B) $y = x$ C) $y = 0$ D) $x = 0$
51. Let $\log 1.6 = 0.2041$. The value of x which makes $10^{x-1} = 16$ is:
- A) 1.2041 B) 2.2041 C) 0.8961 D) -0.7959
52. When solving the equation $\log x^2 = 2 \log x$, the solution set is the set of:
- A) Negative real numbers B) Real numbers except zero
C) Positive real numbers D) Real numbers
53. Suppose that the population of bacteria in a culture increases by 60% every hour. How long would it take (to the nearest hour) for the population of the bacteria become 100 times its initial population? (use the value: $\log 1.4 = 0.15$, $\log 1.6 = 0.2$, $\log 6 = 0.78$)
- A) 1.5 hours B) 13 hours C) 10 hours D) 8 hours
54. The solution set of the equation given by $\log(x^2 - 3) = 2 \log(x - 1)$ is:
- A) $\{2\}$ B) $\left\{\frac{1}{2}\right\}$ C) $\emptyset$ D) $\{4\}$



**MATHEMATICS WORKSHEET OF SELECTED TOPICS FROM
GRADE 10 FOR SUMMER TUTORIAL PROGRAM AT ARSI
UNIVERSITY(ACADEMIC YEAR 2016/2024)**



55. If birr 20,000 is deposited in a bank at a rate of 12% interest compounded monthly, how long will it take to double the amount?
- A) 5.81 years B) 7.59 years C) 5 years D) 6 years
56. What is the solution set of the equation $\left(\frac{64}{729}\right)^x - \left(\frac{9}{4}\right)^{2x-1} = 0$?
- A) $\left\{\frac{5}{2}\right\}$ B) $\{5\}$ C) $\left\{\frac{1}{5}\right\}$ D) $\left\{\frac{2}{5}\right\}$
57. Which one of the following is false about the graphs of the functions $y = 3^x$ and $y = \log_3 x$?
- A) The domain of one is equal to the range of the other and vice versa
- B) The graphs of both functions have different intercepts
- C) The graph of one of them is obtained by reflecting the graph of the other along the line $y = x$
- D) The graph of $y = 3^x$ rises as x increases where as that of $y = \log_3 x$ falls as x increases
58. Consider the graphs of the functions $y = a^x$ and $y = \log_a x$ for $a > 0$ and $a \neq 1$. Which of the following is true about the functions?
- A) For $a > 1$, the graphs of both $y = a^x$ and $y = \log_a x$ are increasing on $(0, \infty)$
- B) For $0 < a < 1$, the y -axis is an asymptote of the graphs of $y = a^x$ and $y = \log_a x$
- C) The graph of $y = a^x$ is a reflection of the graph of $y = \log_a x$ about the origin
- D) The graph of $y = a^x$ is a reflection of the graph of $y = \log_a x$ along $y = -x$
59. What is the solution set of the equation $3^{x-x^2} = \frac{1}{9}$?
- A) $\{1, -2\}$ B) $\{-1, 2\}$ C) $\{0, 1\}$ D) $\{-1, 0\}$
60. Consider the graph of $f(x) = \log_5(x - 3)$. Which one of the following is NOT true about the function f ?
- A) The domain of f is the set of all real numbers greater than -3
- B) The x -intercept of the graph of f is -2
- C) The y -axis is a vertical asymptote of the graph of f
- D) The function increases as the value of x increases
61. Let x and y be real numbers and $x > 0$. If $y = \log_{\sqrt{10}}\left(\frac{1}{x}\right)$, which one of the following equations is true?
- A) $x = 10^{-2y}$ B) $x = 10^{2y}$ C) $x = 10^{-\frac{1}{2}y}$ D) $x = 10^{\frac{1}{2}y}$



**MATHEMATICS WORKSHEET OF SELECTED TOPICS FROM
GRADE 10 FOR SUMMER TUTORIAL PROGRAM AT ARSI
UNIVERSITY(ACADEMIC YEAR 2016/2024)**



62. What is the value of x that satisfies the equation $5\left(\frac{125}{8}\right)^{\frac{1}{3}x^2 - \frac{1}{3}x} = 2$?

- A) 1 B) $-\frac{3}{2}$ C) $\frac{3}{2}$ D) 4

63. The solution set of the equation $5 \log_9 x - 2 \log_9 x^2 - \log_4 8 = -1$ is:

- A) {4} B) {-3} C) {9} D) $\left\{\frac{3}{2}\right\}$

64. What is the value of x in the equation $\sqrt{125^x 5^{2x-1}} = 25^{3x+1}$?

- A) -5 B) $-\frac{5}{7}$ C) 5 D) $\frac{5}{7}$

Unit: 3

65. The solution set of $|2x - 5| \geq 3$ is:

- A) $\{x: x \leq -4 \text{ or } x \geq -3\}$ B) $\{x: x \leq -1 \text{ or } x \geq 4\}$
C) $\{x: x \leq 1 \text{ or } x \geq 4\}$ D) $\{x: x \leq 4 \text{ or } x \geq 3\}$

66. The solution set of the inequality $x^2 + 7x + 12 \geq 0$ is:

- A) $\{x: x \leq -4 \text{ or } x \geq -3\}$ B) $\{x: x \leq -1 \text{ or } x \geq 4\}$
C) $\{x: x \leq 1 \text{ or } x \geq 4\}$ D) $\{x: x \leq 4 \text{ or } x \geq 3\}$

67. What is the solution set of $|2x - 5| - 2 < \sqrt{3}$?

- A) $\left(\frac{3-\sqrt{3}}{2}, \frac{7+\sqrt{3}}{2}\right)$ B) $\left(-\infty, \frac{-\sqrt{3}-2}{2}\right) \cup \left(\frac{\sqrt{3}-2}{2}, \infty\right)$ C) $\emptyset$ D) $\left(\frac{-2-\sqrt{3}}{2}, \frac{\sqrt{3}-2}{2}\right)$

68. Which one of the following intervals is the solution set of the inequality $x^2 - 5x + 6 \leq 0$? A) $[3, \infty)$ B) $(0, 3)$ C) $(2, 3)$ D) $(0, 2)$

69. What is the solution set of the quadratic inequality $-2x^2 + 5x - 3 < 0$?

- A) $(-\infty, \infty)$ B) $(-\infty, -1) \cup (1, \infty)$ C) $(-\infty, 1) \cup \left(\frac{3}{2}, \infty\right)$ D) $\left(1, \frac{3}{2}\right)$

70. The solution set of the inequality $3x^2 + 35x - 12 < 0$ is:

- A) $\left(-12, \frac{1}{3}\right)$ B) $\left(-\infty, \frac{1}{3}\right)$ C) $(-12, 1)$ D) $(-\infty, -12)$

71. Which one of the following interval(s) is the solution set of the quadratic inequality $10x^2 - 4x - 6 < 8x^2 + 4x - 12$?

- A) $(1, 3)$ B) $(3, \infty)$ C) $(-\infty, 1)$ D) $(-\infty, 1) \cup (3, \infty)$

72. The solution set of the inequality $(2x - 3)(x + 5) \leq 0$ is:

- A) $\left(-5, \frac{3}{2}\right)$ B) $(-\infty, -5) \cup \left[\frac{3}{2}, \infty\right)$ C) $\left(-\infty, -\frac{3}{2}\right) \cup [5, \infty)$ D) $\left[-5, \frac{3}{2}\right]$

73. Interval notation of the set $\{x: 4x - 6 < x < 7\}$ is:

- A) $\{\}$ B) $(2, 7)$ C) $(-\infty, 7)$ D) $(-\infty, 2)$

74. Which of the following ordered pairs are solutions of the system of
$$\begin{cases} -2x + 5y \geq 3 \\ y < 4 \\ -4x + 2y > 7 \end{cases} ?$$

- A) $(-6, 4)$ B) $(-3, 2)$ C) $(-8, -2)$ D) $(0, 2)$



**MATHEMATICS WORKSHEET OF SELECTED TOPICS FROM
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UNIVERSITY(ACADEMIC YEAR 2016/2024)**



75. A shop owner selling x pairs of shoes per day has a profit (in birr) expressed by the equation $p(x) = -x^2 + 25x - 10$. If the owner needs to obtain a profit of more than 140 birr per day, then the number of pairs of shoes the shop owner makes should be in the range between:
- A) 10 and 15 B) 5 and 10 C) 12 and 10 D) 5 and 15
76. Let $R = \{(x, y) : y + 4x \leq 6, x \geq 1, \text{ and } y \geq 0\}$. What element of R makes $x - y$ maximum? A) (1, 2) B) (1, 0) C) $(\frac{1}{2}, 4)$ D) $(\frac{3}{2}, 0)$
77. What is the solution set of the inequality $-x^2 + 5x - 4 \leq 0$? A) $(-\infty, 1) \cup (4, \infty)$
B) $(\frac{5}{2}, \infty)$ C) [1, 4] D) $(-\infty, 1] \cup [4, \infty)$
78. What is the solution of the inequality $4x^2 - 12x + 9 \leq 0$?
A) $\{\}$ B) $(-\infty, 0)$ C) $\{\frac{3}{2}\}$ D) $\mathbb{R}$
79. If $a < 1$ and $(a - 1)x > (a^2 - 1)$ then to which of the following sets does x belong?
A) $(a + 1, \infty)$ B) $(-\infty, 1)$ C) $\{\}$ D) $(-\infty, a + 1)$
80. The solution set of the inequality $|x + 1| < 2x$ is:
A) $\{x : x \geq 1\}$ B) $\{x : x > -\frac{1}{3}\}$
C) $\{x : x > 1\}$ D) $\{x : x < \frac{1}{3} \cup x > 1\}$