

## Midterm Review Packet

Name:

1. Solve the equation by factoring.  $x^2 + x - 72 = 0$
2. Solve the equation using any method.  
 $2x^2 + 4x = 16$
3. Find the exact solution of the following quadratic equation by using the Quadratic Formula.
4. Solve for x:  $2x^2 + 128 = 0$

$$-x^2 + 6x + 10 = 0$$

5. Write a quadratic equation with the given roots. Write the equation in the form  $ax^2 + bx + c = 0$ , where a, b, and c are integers.
6. What value of  $h$  is needed to complete the square for the equation  $x^2 - 2x + 9 = (x - h)^2 + 8$ ?

-9 and 3

7. Determine whether the function has a maximum or minimum value. Then find the maximum or minimum value of the function.
8. Consider the quadratic function  $f(x) = -x^2 + 4x - 3$ . Find the y-intercept and the equation of the axis of symmetry.

$$f(x) = 2x^2 + 10x + 3$$

9. Find the value of the discriminant. Then describe the number and type of roots for the equation.
10. Multiply:  $(3 + 2i)(8 - 9i)$

$$x^2 - 5x + 8 = 0$$

11. Simplify:  $\frac{(3 + 6i)^2}{2i}$
- A  $\frac{27i}{2}$
- B  $9 + 18i$
- C  $18 + 27i$
- D  $\frac{36 + 27i}{2}$
12. The area of a rectangular window is  $(4x^2 - 21x - 18)$ . Both the length and the width are polynomials with integer coefficients. Which of the following could represent the length of the window?
- A  $4x + 6$
- B  $4x + 3$
- C  $x + 6$
- D  $x + 3$

13. Multiply and distribute.

$$3(x + 6)(2x + 1)$$

15. Distribute and combine like terms.

$$2(x^3 - 2x^2 + x - 2) - 3(3x^3 - 2x + 5)$$

17. If  $h(x) = 2x$  and  $g(x) = 3x^2 + 1$ , what is  $h(g(x))$ ?

- A  $6x^2 + 1$
- B  $6x^2 + 2$
- C  $12x^2 + 1$
- D  $12x^2 + 2$

19. Find  $(f + g)(x)$  for the following functions.

$$f(x) = 3x^3 - 13x^2 - 8$$

$$g(x) = -11x^2 - 18$$

20. Find  $(f \cdot g)(x)$  for the following functions.

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

$$g(x) = 2x - 5$$

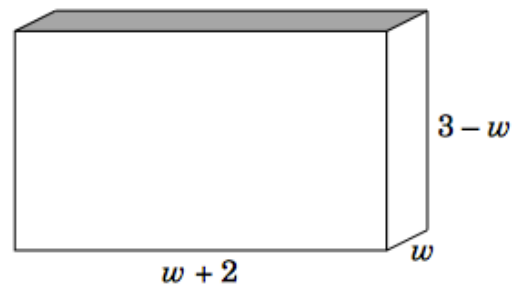
14. Write in simplest form.

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

16. What are the zeros of the polynomial  $p(x) = x^3 - 2x^2 - 23x + 60$ ?

- A  $\{-15, -2, 2\}$
- B  $\{-5, 3, 4\}$
- C  $\{2, 3, 10\}$
- D  $\{1, 2, 30\}$

18. The dimensions of this rectangular prism are given algebraically.



What is the **approximate** width ( $w$ ) that will maximize the volume?

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

21. Write a function that represents exponential growth and has a y-intercept of 3.

23. Divide:

$$(6x^3 - 11x^2 - 47x - 20) \div (2x + 1)$$

A  $3x^2 - 7x - 20$

B  $3x^2 + 7x - 20$

C  $3x^2 - 4x - 20$

D  $3x^2 + 4x - 20$

25. For the given graph,
- describe the end behavior,
  - determine whether it represents an odd-degree or even-degree polynomial function,
  - and state the number of real zeros.



22. Factor by grouping.

$$12p^3 - 21p^2 + 28p - 49$$

24. Which binomial is a factor of  $(x^3 - x^2 + 3x - 3)$ ?

A  $x - 3$

B  $x + 1$

C  $x^2 - 1$

D  $x^2 + 3$

26. Which expression is equivalent to

$$\frac{2x + 6}{x^2 + 2x - 24} \cdot \frac{x^2 + 2x - 24}{x^2 - 7x + 12}?$$

A  $\frac{2}{x - 4}$

B  $\frac{2(x + 3)}{x - 3}$

C  $\frac{2(x + 3)}{(x - 4)(x - 3)}$

D  $\frac{2(x + 3)}{(x + 4)(x - 3)}$

27. Estimate the x-coordinates at which the relative maxima and relative minima occur for the function.

$$f(x) = 3x^3 - 10x^2 + 9x + 4$$

28. Find  $g(-2)$  and  $g(4)$  for the function  $g(x) = 2x^4 + 3x^3 - 9x^2 + 16x + 13$

29.  $\frac{1}{9x^2 - 16} + \frac{2}{3x + 4} =$

30.  $11 + \frac{2a}{3b} =$

31. Solve for  $x$ .

$$\frac{x}{x+4} = \frac{x-4}{6}$$

32. For an annual rate of change of  $-22\%$ , find the corresponding growth or decay factor.

33. Find the annual percent increase or decrease that  $y = 2.5(1.34)^x$  models.

34. An initial population of 700 squirrels increases at an annual rate of  $3.5\%$ . Write an exponential function to model the quail population.

35. The volume of a rectangular prism is represented by the expression  $(x^3 - 2x^2 - 20x - 24)$ . If the length is  $(x - 6)$  and the height and width are equal, what is the width of the prism?

A  $x + 2$

B  $x - 2$

C  $x + 4$

D  $x - 4$

36. **Approximately** what is the smallest real zero of  $f(x) = x^3 - 5x^2 + 2x + 6$ ?

A  $-4.18$

B  $-1.68$

C  $-0.86$

D  $-0.46$

37. Suppose  $p(x) = x^3 - 2x^2 + 13x + k$ . The remainder of the division of  $p(x)$  by  $(x + 1)$  is  $-8$ . What is the remainder of the division of  $p(x)$  by  $(x - 1)$ ?

A  $-8$

B  $8$

C  $16$

D  $20$

38. Let  $f(x) = 14x^3 + 28x^2 - 46x$  and  $g(x) = 2x + 7$ . Which is the solution set to the equation  $\frac{1}{12}f(x) = g(x)$ ?
- A  $\{-3, 0, 1\}$   
B  $\{-3, -1, 2\}$   
C  $\{-2, 1, 3\}$   
D  $\{1, 5, 11\}$
39. Which expression is equivalent to  $\frac{x+7}{x^2+4x-21} + \frac{x+5}{x^2+8x+15}$  when  $x$  is restricted so that the expressions are defined?
- A  $\frac{x+3}{x-3}$   
B  $\frac{x-3}{x+3}$   
C  $1$   
D  $-1$
40. A city built an archway that can be modeled by the parabola  $y = -x^2 + 8x + 20$ . What are the coordinates of its vertex?
- A  $(-4, 36)$   
B  $(-2, 10)$   
C  $(4, 36)$   
D  $(2, 10)$
41. Zach purchased a stock. The value of the stock has been falling and rising as described by the polynomial function  $V(x) = 2x^3 - 90x + 350$ , where  $x$  is the number of weeks since the stock was purchased. What does the  $y$ -intercept of this function represent?
- A the number of weeks since the stock was purchased  
B the value of the stock at its maximum  
C the value of the stock when it was initially purchased  
D the week at which the value was at its maximum

42. Samantha invested \$10,000 in each of two different financial plans in 2013. The predicted value of each plan is modeled below.
- Plan M: a rate of 7.5%, compounded continuously.
  - Plan N: The value is determined by the function  $y = 5x^3 - 50x^2 + 4x + 10,000$ , where  $x$  is the number of years after 2013.

Plan N has a greater predicted value than Plan M during which years?

- A from 2014 to 2041  
B from 2028 to 2055  
C from 2042 to 2073  
D Plan N never has a greater value than Plan M.
43. Which choice shows the solutions to the equation  $8x^2 + 3x = -7$ ?

A  $\frac{-3 \pm i\sqrt{215}}{16}$

B  $\frac{3 \pm i\sqrt{215}}{16}$

C  $\frac{-3 \pm \sqrt{233}}{16}$

D  $\frac{3 \pm \sqrt{233}}{16}$

44. A system of equations is shown below.

$$y = |x - 3|$$

$$y = \frac{1}{2}x$$

What is the distance between the points of intersection of the system?

A  $\sqrt{6}$

B  $\sqrt{20}$

C  $\sqrt{48}$

D  $\sqrt{80}$

45. Fred drives an average of 15,000 miles per year, and his car gets 20 miles per gallon of gasoline.
- The average cost of gasoline is \$3.25 per gallon.
  - He buys a new car.
  - In his new car, Fred continues to average 15,000 miles per year, and the average cost of gasoline remains the same.

**Approximately** how many more miles per gallon does the new car get if Fred has a savings of \$650 per year on gasoline?

- A 5.8 mpg
  - B 7.3 mpg
  - C 8.8 mpg
  - D 10.3 mpg
46. A shipping company is designing boxes to meet specific requirements.
- Each box must be a completely closed rectangular prism with no overlapping material.
  - The boxes must hold 24 cans in two layers of 12 cans each.
  - The cans are 3 inches in diameter and 5 inches in height.

What is the smallest amount of cardboard needed to meet the specifications?

- A 1,080 in.<sup>2</sup>
  - B 840 in.<sup>2</sup>
  - C 636 in.<sup>2</sup>
  - D 540 in.<sup>2</sup>
47. Which expression is equivalent to  $(4 - 3i)^2 + (6 + i)^2$ ?
- A 30
  - B  $42 - 12i$
  - C 50
  - D  $62 - 12i$

48. The equation  $2x^2 - 5x = -12$  is rewritten in the form of  $2(x - p)^2 + q = 0$ . What is the value of  $q$ ?

A  $\frac{167}{16}$

B  $\frac{71}{8}$

C  $\frac{25}{8}$

D  $\frac{25}{16}$

49. What is the solution to the equation  $\frac{2x - 3}{x - 1} = \frac{8x + 1}{4x + 5}$ ?

A  $-\frac{14}{5}$

B  $-\frac{14}{9}$

C  $\frac{14}{9}$

D  $\frac{14}{5}$

50. A farmer wants to buy between 90 and 100 acres of land.

- He is interested in a rectangular piece of land that is 1,500 yards long and 300 yards wide.
- The piece of land is being sold as one complete unit for \$87,000.

If the farmer does not want to spend more than \$900 an acre, does the land meet all of his requirements? (1 acre  $\approx$  43,560 ft<sup>2</sup>)

- A Yes, the amount of land satisfies his needs, and the price is low enough.
- B No, the price is low enough, but there is too much land.
- C No, the price is low enough, but there is not enough land.
- D No, the amount of land satisfies what he needs, but the price is too high.



