

## Exam 3 Review Questions

- Given the quadratic function  $f(x) = 2(x + 5)^2 - 8$ , find the following:
  - Whether the Graph opens up or opens down
  - The Vertex
  - The  $y$ -intercept
  - The minimum or maximum value of the function
  - The axis of symmetry
  - The Domain of the Function
  - The Range of the Function
- Use completing the square to write the quadratic function  $f(x) = x^2 + 8x + 7$  in Vertex Form.
- Find the vertex of the quadratic function  $f(x) = 4x^2 - 64x + 107$  using the Vertex Formula.
- A long jumper leaves the ground at an angle of  $20^\circ$  above the horizontal, at a speed of 11 m/sec. The height of the jumper can be modeled by  $h(x) = -0.046x^2 + 0.364x$ , where  $h$  is the jumper's height in meters and  $x$  is the horizontal distance from the point of launch. (Answer the following with complete sentences.)
  - At what horizontal distance from the point of launch does the maximum height occur? Round to the nearest hundredth.
  - What is the maximum height of the long jumper? Round to the nearest hundredth.
  - What is the length of the jump? Round to the nearest tenth.
- Gas mileage is tested for a car under different driving conditions. At lower speeds, the car is driven in stop and go traffic. At higher speeds, the car must overcome more wind resistance. The variable  $x$  given in the table represents the speed (in mph) for a compact car, and  $m(x)$  represents the gas mileage (in mpg).

$x$	25	30	35	40	45	50	55	60	65
$m(x)$	22.7	25.1	27.9	30.8	31.9	30.9	28.4	24.2	21.9

- a. Use regression to find a quadratic function to model the data.
- b. At what speed is the gas mileage the greatest? Round to the nearest mile per hour.
- c. What is the maximum gas mileage? Round to the nearest mile per gallon.

6. Determine the End Behavior of the polynomial function

$$P(x) = -86x^{63} + 44x^{22} - 6x^7 - 22x^2 + 7$$

Explain how you arrived at your answer.

7. Find the zeros and state their multiplicities for the function

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

8. Use the Intermediate Value Theorem to determine if the function

$$f(x) = 2x^3 - 5x^2 - 15x + 20$$

has a zero on the interval  $[-1, 1]$ .

9. Make a sketch of the polynomial function

$$P(x) = x^4 - 5x^3 - 4x^2 + 44x - 48$$

$$\text{Factored form } P(x) = (x - 2)^2(x - 4)(x + 3)$$

To aid in sketching find the end behavior; zeros and multiplicities; and the  $y$ -intercept.

10. Use Long Division of polynomials to divide the following

$$(6x^4 - 4x^3 + 4x^2 - 10x - 25) \div (2x^2 - 3x + 5)$$

Identify the Quotient and the Remainder.

11. Use Synthetic Division of polynomials to divide the following

$$(2x^5 - 26x^3 - 14x^2 - 33x - 28) \div (x - 4)$$

Identify the Quotient and the Remainder.

12. Given  $f(x) = 3x^3 + 5x^2 - 6x + 2$ , use the Remainder Theorem to evaluate  $f(-2)$  and  $f(2)$ .
13. Given  $f(x) = 2x^3 - 5x^2 - 6x + 9$ , use the Remainder Theorem to determine if 3 or 4 is a zero of the polynomial.
14. Find all of the zeros and give the linear factorization of  $f(x) = 3x^3 + 16x^2 - 5x - 50$ , given that  $-2$  is a zero.
15. Find all the zeros of the function  $f(x) = x^4 + x^3 - 3x^2 + 9x - 108$  given that  $-3i$  is one of the zeros. Write  $f(x)$  as a product of linear factors.
16. Find a polynomial of degree three that has  $2i$  and  $5$  as some of its zeros.

17. Find and list all **possible rational zeros** of the polynomial function

$$p(x) = 2x^4 + 3x^2 - 5x + 18$$

18. Find all the zeros of the function  $f(x) = x^3 - 7x^2 + 14x - 6$ . Give exact values.
19. Write a polynomial of degree 3 with integer coefficients with zeros  $-4i$  and  $\frac{3}{2}$

20. Using the graph of the rational function  $f(x) = \frac{2x}{x-4}$  find the following:

- As  $x \rightarrow -\infty, f(x) \rightarrow$  \_\_\_\_\_
- As  $x \rightarrow 4^-, f(x) \rightarrow$  \_\_\_\_\_
- As  $x \rightarrow 4^+, f(x) \rightarrow$  \_\_\_\_\_
- As  $x \rightarrow \infty, f(x) \rightarrow$  \_\_\_\_\_
- The domain is \_\_\_\_\_
- The range is \_\_\_\_\_
- The vertical asymptote is the line \_\_\_\_\_
- The horizontal asymptote is the line \_\_\_\_\_

21. Determine the vertical asymptote(s) of the following functions.

a.  $f(x) = \frac{x-3}{2x^2-9x-5}$

b.  $f(x) = \frac{x+5}{x^2-x-6}$

22. Identify the horizontal asymptote for each of the following rational functions.

a.  $h(x) = \frac{3x^2+8x-5}{x^2+3}$

b.  $g(x) = \frac{x+3}{2x^2-3x-5}$

c.  $f(x) = \frac{x^3-x^2+1}{2x-3}$

23. Given the rational function  $f(x) = \frac{x^3+3x^2-2x-4}{x^2-7}$  find the slant asymptote.

24. Graph the Rational Function  $f(x) = \frac{x^2-2x-8}{x^2-9}$  To aid in graphing find the following

a. Domain \_\_\_\_\_

b. Range \_\_\_\_\_

c. Vertical asymptotes \_\_\_\_\_

d. Horizontal or slant asymptotes \_\_\_\_\_

e. y-intercept \_\_\_\_\_

f. x-intercept(s) \_\_\_\_\_

g. Where the graph crosses the horizontal asymptote if applicable \_\_\_\_\_

h. Additional Points \_\_\_\_\_

25. Write a variation model for each situation

- The volume  $V$  of a rectangular solid varies jointly as the length  $l$  and the width  $w$  of the solid.
- Simple Interest  $I$  on a loan or investment varies directly as the amount  $A$  of the loan.
- The average daily Cost  $C$  to rent a car is inversely proportional to the number of miles  $M$  driven.

26. The yield on a bond varies inversely as the price. The yield on a particular bond is 5% when the price is \$120. What would the yield be when the price is \$100.

27. Given the system of equations 
$$\begin{aligned} 3x - 5y &= -7 \\ x - 4y &= -7 \end{aligned}$$
 determine if the ordered pair is a solution.

a.  $\left(-2, \frac{1}{5}\right)$

b.  $(1, 2)$

28. Solve the system of equations 
$$\begin{aligned} x + 3y &= 5 \\ 3x - 2y &= 18 \end{aligned}$$
 using the substitution method.

29. Solve the system of equations 
$$\begin{aligned} 6x + y &= 4 \\ 20x - 7y &= 3 \end{aligned}$$
 using the addition/elimination method.

30. Bryan and Jady had barbeque potato chips and soda at a football party. Bryan ate 3 oz. of chips and drank 2 cups of soda for a total of 700 mg of sodium. Jady ate 1 oz. of chips and drank 3 cups of soda for a total of 350 mg of sodium. How much sodium is in 1 oz. of chips and how much sodium is in 1 cup of soda?