

No electronic devices or calculators allowed. Show all of your work on this test paper. Put answers in the blanks provided. This exam has 40 questions worth 200 points. The point values of each question are shown in the left margin in [brackets].

PART I: SHORT ANSWER QUESTIONS

- [6] 1. Perform the indicated operation and simplify. Leave answer in factored form.

$$\frac{y^2 + 16y + 64}{y^2 - 81} \cdot \frac{y^2 + 9y}{y + 8}$$

1. _____

- [6] 2. Perform the indicated operation and simplify. Leave answer in factored form.

$$\frac{5}{x + 4} - \frac{3}{x - 4}$$

2. _____

- [5] 3. Factor completely. If the polynomial cannot be factored, say it is prime.

$$8s^2 + 31s + 21$$

3. _____

- [5] 4. Factor completely. If the polynomial cannot be factored, say it is prime.

$$64m^3 + 27$$

4. _____

- [6] 5. Perform the indicated operation and simplify. Leave answer in factored form.

$$4 + \frac{2}{x} \\ \frac{x}{4} + \frac{1}{8}$$

5. _____

- [6] 6. Simplify the expression. Write your answer using only positive exponents.

$$\frac{y^{1/3}}{y^{3/5}}$$

6. _____

- [6] 7. Simplify the expression. Write your answer using only positive exponents.

$$\left(\frac{3p^{-5}r}{2p^3}\right)^{-3}$$

7. _____

[5] 8. Simplify the expression completely.

$$8\sqrt{3} + 8\sqrt{75}$$

8. _____

[6] 9. Find the distance between the pair of points. Simplify your answer.

$$(2, 6) \quad \text{and} \quad (-7, -7)$$

9. _____

[6] 10. Find all real solutions to the equation. You must show work to support your answer.

$$\sqrt{2-x} = 1 - 2x$$

10. _____

[6] 11. Find all real solutions to the equation. You must show work to support your answer.

$$x^3 - 4x^2 - 5x + 20 = 0$$

11. _____

[6] 12. Find all real solutions to the equation. You must show work to support your answer.

$$x^2 + 4x + 4 = 11$$

12. _____

[6] 13. Find the radius and the center of the circle

$$x^2 + y^2 - 2x + 14y = 31$$

Center: _____ Radius: _____

[6] 14. Solve the system of linear equations:

$$\begin{cases} x - 2y = 18 \\ 2x - 2y = 26 \end{cases}$$

Answer: $x =$ _____, $y =$ _____

- [6] 15. Solve the inequality and write your answer using interval notation. If no solution exists, write “no solution.”

$$(x + 7)(x^2 - 25) > 0$$

15. _____

- [6] 16. Solve the inequality and write your answer using interval notation. If no solution exists, write “no solution.”

$$\frac{2x - 5}{-2} < \frac{1}{2}$$

16. _____

- [7] 17. Find the difference quotient $\frac{f(x+h) - f(x)}{h}$ and simplify until it is defined when $h = 0$ for the function $f(x) = 5 - 2x^2$. Simplify your answer.

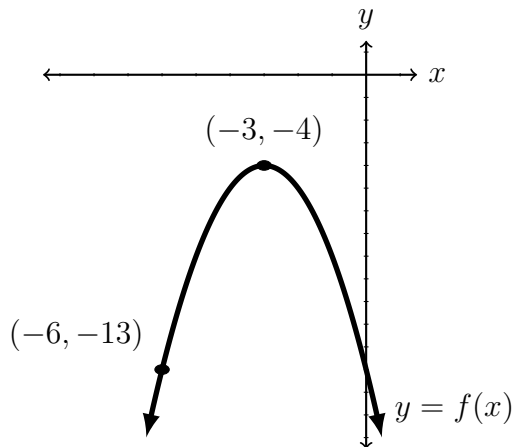
17. _____

- [6] 18. Solve the inequality and write your answer using inequality notation. If no solution exists, write “no solution.”

$$|2x + 14| \leq 8$$

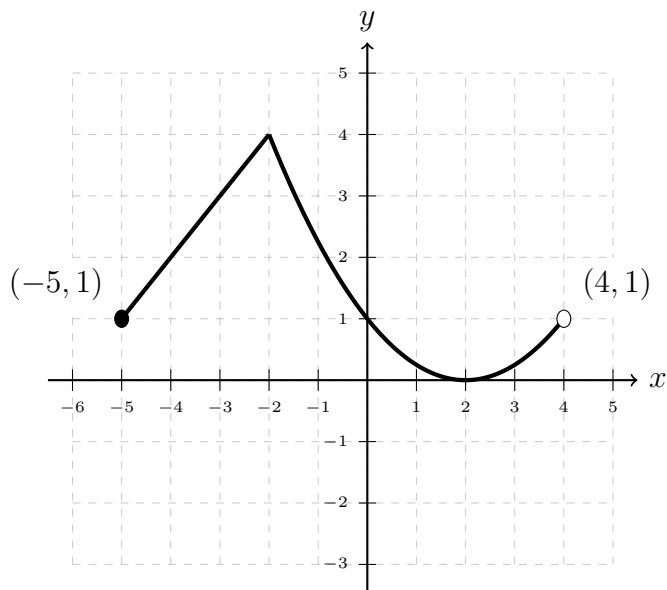
18. _____

- [6] 19. Find the equation of the quadratic function $f(x)$ whose graph is shown below.



19. _____

- [8] 20. Use the graph of the function f shown below to answer the following questions.



- (a) Find $f(2)$.

- (b) What is the domain of f ?

- (c) What is the range of f ?

- (d) When is $f(x) = 1$?

PART II: MULTIPLE CHOICE QUESTIONS. Each question is worth 4 points. Write the letter corresponding to your answer in each blank.

[4] 21. _____ Simplify the expression and write using positive exponents: $2n^{-3}$

- A. $\frac{-6}{n^3}$ B. $\frac{1}{2n^3}$ C. $\frac{1}{8n^3}$ D. $-2n^3$ E. $\frac{2}{n^3}$

[4] 22. _____ Rationalize the denominator and simplify: $\frac{\sqrt{5}}{2 + \sqrt{7}}$

- A. $\frac{\sqrt{35} + 2\sqrt{5}}{3}$ B. $\frac{\sqrt{35} - 2\sqrt{5}}{9}$ C. $\frac{2\sqrt{5} - \sqrt{35}}{-3}$ D. $\frac{3\sqrt{35} + 75}{14}$

[4] 23. _____ Simplify the expression: $\sqrt[3]{x^2} \cdot \sqrt[4]{x}$

- A. $\sqrt[12]{x^3}$ B. $\sqrt[6]{x}$ C. $\sqrt[12]{x^{11}}$ D. $\sqrt[7]{x^3}$ E. None of these

[4] 24. _____ Factor completely: $4m(5x + 3) - 5(5x + 3)$

- A. $4m - 5(5x + 3)$ B. $(4m - 5)(5x + 3)$ C. $(4m - 5)(5x + 3)(5x + 3)$
D. $20mx + 12m - 25x - 15$

[4] 25. _____ Combine the polynomials and simplify.

$$2(9x^3 - 3x) - 3(9x^3 + 6x^2 - 2x)$$

- A. $18x^3 - 6x^2 - x$ B. $9x^3 + 18x^2 - 12x$ C. $6x^2 - 5x$
D. None of these.

[4] 26. _____ Evaluate and simplify:

$$\left(\frac{-27}{64}\right)^{-2/3}$$

- A. $\frac{9}{16}$ B. $\frac{-9}{16}$ C. $\frac{16}{9}$ D. Not a real number

[4] 27. _____ Find the equation of a line going through the point (1, 2) that is parallel to $y = -\frac{2}{5}x + 2$.

- A. $y = -\frac{2}{5}x + \frac{12}{5}$ B. $y = \frac{5}{2}x - 2$ C. $y = -\frac{5}{2}x + \frac{1}{5}$ D. $y = -\frac{2}{5}x + 2$

[4] 28. _____ For the function $f(x) = 4x - 1$, find and simplify $f(x + 3)$.

- A. $4x + 2$ B. $4x - 1(x + 3)$ C. $(4x - 1)(x + 3)$ D. None of these.

[4] 29. _____ For the function $f(x) = 4x - 3$, find and simplify the inverse function $f^{-1}(x)$.

- A. $f^{-1}(x) = \frac{1}{4x - 3}$ B. $f^{-1}(x) = \frac{1}{4}x + \frac{1}{3}$ C. $f^{-1}(x) = \frac{1}{4x} - 3$ D. $f^{-1}(x) = \frac{x + 3}{4}$

[4] 30. _____ Find the domain of $f(x) = \sqrt{2x - 10}$.

- A. $x \geq 5$ B. $x \neq 5$ C. $x > 5$ D. $x \leq 5$ E. $x > 5$

[4] 31. _____ Convert the exponential expression $s^4 = t$ to logarithmic form.

- A. $\log_4(t) = s$ B. $\log_s(4) = t$ C. $\log_t(s) = 4$ D. $\log_s(t) = 4$ E. None of these.

[4] 32. _____ Evaluate the logarithm: $\log_3\left(\frac{1}{27}\right)$

- A. -2 B. -3 C. $-\frac{1}{3}$ D. $\frac{1}{9}$

[4] 33. _____ Solve for x : $2^{2-3x} = \frac{1}{4}$

- A. $x = -2/3$ B. $x = 4/3$ C. $x = 1/4$ D. $x = 3/4$ E. None of these.

[4] 34. _____ Solve for x : $|3 - 2x| = 4$

- A. $x = -7/2, x = 1/2$ B. $x = -1/2, x = 7/2$ C. $x = 1/2, x = -1/2$ D. $x = -1/2$

[4] 35. _____ Solve for x : $2x^2 = 50$

- A. $x = \sqrt{50}, x = -\sqrt{50}$ B. $x = \pm 25$ C. $x = 5$ D. $x = -5, x = 5$

[4] 36. _____ Solve for x : $2x - \frac{7}{x} = 13$

- A. $x = -1$ B. $x \neq 0$ C. $x = -1/2, x = 7$ D. $x = 1, x = -7/2$

[4] 37. _____ Find the vertex of the quadratic function:

$$y = 3x^2 + 24x + 49$$

- A. $(-4, 3)$ B. $(1, -4)$ C. $(-4, 1)$ D. $(4, 4)$ E. $(-4, -1)$

[4] 38. _____ Solve the inequality and write the answer in interval notation:

$$-2 > 5x + 3 \geq -22$$

- A. $[-5, -1)$ B. $(-5, -1]$ C. $[-5, -1]$ D. $(-5, -1)$

[4] 39. _____ Find any vertical asymptote(s) of $f(x) = \frac{2x + 10}{x^2 - 9}$.

- A. $x = -5, x = 3$ B. $y = 0$ C. $x = 3, x = -3$ D. $y = 2$ E. None of these.

[4] 40. _____ Find any horizontal asymptote(s) of $f(x) = \frac{2x + 10}{x^2 - 9}$.

- A. $x = -5, x = 3$ B. $y = 0$ C. $x = 3, x = -3$ D. $y = 2$ E. None of these.