

Name _____

Answer all questions in the booklet provided. Each multiple choice question is worth 5 points; there is no partial credit. Each short answer question is worth 10 points; show all work to receive credit.

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

- Round 16.958741 to 3 decimal places.
(a) 16.9 (b) 17.0 (c) 16.958 (d) 16.959 (e) None of the above
- If a right triangle has hypotenuse 7 and one leg 2, what is the length of the other leg?
(a) 9 (b) $\sqrt{53}$ (c) 5 (d) $3\sqrt{5}$ (e) None of the above
- Factor as completely as possible: $162x^4y^2 - 2y^2z^8$
(a) $2y^2(81x^4 - z^8)$ (b) $2(81x^4y^2 - y^2z^8)$ (c) $2y^2(9x^2 - z^4)^2$
(d) $2y^2(9x^2 + z^4)(3x + z^2)(3x - z^2)$ (e) None of the above
- Find the area A and circumference C of a circle with diameter 10.
(a) $A = 100\pi$, $C = 20\pi$ (b) $A = 25\pi$, $C = 20\pi$ (c) $A = 25\pi$, $C = 10\pi$
(d) $A = 100\pi$, $C = 10\pi$ (e) None of the above
- Solve for x : $\frac{8}{x^2-1} = \frac{2}{x^2-1} + \frac{1}{x-1}$
(a) ± 1 (b) $-1, 0, 1$ (c) 5 (d) 6 (e) None of the above
- Using the variable x , write the interval $(4, 6]$ as an inequality.
(a) $4 < x < 6$ (b) $4 \leq x < 6$ (c) $4 < x \leq 6$ (d) $4 \leq x \leq 6$ (e) None of the above
- Solve the inequality for x : $-10 \leq 2x - 8 < 4$
(a) $[-10, 8)$ (b) $(-1, 6]$ (c) $[2, 6)$ (d) $[-1, 6)$ (e) None of the above

8. Solve for x : $|x + 2| = 5$
- (a) $\{3\}$ (b) $\{-2, 5\}$ (c) $\{-7, 3\}$ (d) $\{-5, 0, 2\}$ (e) None of the above
9. Write the equation for x if x varies directly with P and inversely with T squared.
- (a) $x = kPT$ (b) $x = kPT^2$ (c) $x = \frac{kT^2}{P}$ (d) $x = \frac{kP}{T}$ (e) None of the above
10. Find the equation of the line through the points $(-3, 1)$ and $(4, 0)$.
- (a) $y = -\frac{1}{7}x + \frac{4}{7}$ (b) $y = 7x + 4$ (c) $y = \frac{1}{7}x + \frac{10}{7}$ (d) $y = 4x$
- (e) None of the above
11. Where is the graph of the piecewise function $f(x) = \begin{cases} 3x + 10 & \text{for } x < -2 \\ x^2 & \text{for } x \geq -2 \end{cases}$ increasing?
- (a) $(-\infty, -2) \cup (0, \infty)$ (b) $(-\infty, -2)$ (c) $(-2, \infty)$ (d) $(-2, 0)$ (e) None of the above
12. Find the equation of the line that is perpendicular to the line $y = 4x + 2$ and passes through the origin.
- (a) $y = \frac{1}{4}x$ (b) $y = 4x$ (c) $y = -\frac{1}{4}x$ (d) $y = -4x$ (e) None of the above
13. Find the equation of the circle with center $(4, 0)$ and radius 5.
- (a) $x^2 + (y - 4)^2 = 5$ (b) $x^2 + (y - 4)^2 = 25$ (c) $(x - 4)^2 + y^2 = 5$ (d) $(x - 4)^2 + y^2 = 25$
- (e) None of the above
14. Find the domain of the function $f(x) = \sqrt{x}$.
- (a) $x < 0$ (b) $x > 0$ (c) $x = 0$ (d) $x \geq 0$ (e) None of the above
15. Find the composite function $(f \circ g)(x)$ of $f(x) = \frac{2}{x}$ and $g(x) = \frac{5x}{x+3}$.
- (a) $\frac{x+3}{5x}$ (b) $\frac{10x}{x^2+3x}$ (c) $\frac{x+3}{2x}$ (d) $\frac{10}{3x+2}$ (e) None of the above
16. Is the function $f(x) = x^2 + 2$ symmetric with the respect to the x -axis, y -axis, or origin?
- (a) x -axis (b) origin (c) y -axis (d) x -axis and y -axis (e) None of the above

17. Find the vertical asymptote of the graph of $f(x) = \frac{x+8}{x-4}$.
- (a) $x = -8$ (b) $x=4$ (c) $x = 2$ (d) $x = -4$ (e) None of the above
18. Find the vertex of the parabola with equation $y = (x + 1)^2 - 2$
- (a) $(-2, 1)$ (b) $(-2, -1)$ (c) $(1, 2)$ (d) $(-1, 2)$ (e) None of the above
19. Solve the inequality: $x^2 + 5x \leq 24$
- (a) $[-\infty, 0] \cup [3, \infty]$ (b) $[-8, 3]$ (c) $[4, 6]$ (d) $[-\infty, -8] \cup [3, \infty]$ (e) None of the above
20. Find the number needed to complete the square of the expression: $x^2 + \frac{3}{4}x$
- (a) $\frac{3}{8}$ (b) $\frac{3}{16}$ (c) $\frac{9}{16}$ (d) $\frac{9}{64}$ (e) None of the above

Please continue to complete the **SHORT ANSWER** section on the next page.

SHORT ANSWER. Show all work.

21. Factor completely: (a) $x^2 - 8x + 15$ (b) $27x^3 + 8$

22. If $f(x) = \sqrt{x}$ and $g(x) = x - 4$, find the following:

(a) $(f + g)(x)$ (b) $(f \cdot g)(x)$ (c) $(f \circ g)(x)$

23. Simplify each expression. Write the answer to (b) in lowest terms with only positive exponents.

(a) $4\sqrt{32} - 2\sqrt{18}$ (b) $\frac{x^{-3}y^4z^{-1}}{(xy)^3z^2}$

24. Find all solutions to each equation:

(a) $\sqrt{2x - 5} + 2 = 9$ (b) $x^2 + 3x - 20 = 0$

25. Graph the function $f(x) = |x - 3| - 1$.

26. How much water must be evaporated from 10 gallons of a 20% salt solution to create a 25% solution?

27. Find the solution set. Graph it on the real line and express it in interval notation.

$$-3 \leq \frac{4x-1}{3} \leq 1$$

28. (a) Find an equation for the line through $(-4, -6)$ and $(3, 8)$. Graph it.

(b) Find an equation of the perpendicular line through $(2, 0)$. Graph it on the same coordinate axes.

29. Find the center and radius of the circle with equation $x^2 + y^2 - 2x - 6y + 6 = 0$, and graph it.

30. Find the domain of the rational function $f(x) = \frac{1}{x+1} + 2$, and the equations of its horizontal and vertical asymptotes, if any.