

Diagnostic Test | Mathematics

Instructions: Complete the following test in no more than 30 minutes.

- Do not use a calculator for any questions.
- Do not refer to books, notes, or other material while completing the test.
- Only select one answer per question.

1. $2\left(\frac{1}{4} + \frac{2}{3}\right) =$

a) $\frac{22}{24}$

b) $\frac{11}{6}$

c) $\frac{6}{7}$

d) $\frac{6}{14}$

e) $\frac{4}{7}$

2. Express $\frac{1}{y^2} + \frac{2}{x^2y} + \frac{1}{x^2y^3}$ as a single fraction:

a) $\frac{x^2y + 2y^2 + 1}{x^2y^3}$

b) $\frac{4}{x^4y^6}$

c) $\frac{x + 2y}{x^2y^3}$

d) $\frac{x^2 + 3y}{x^2y^2}$

e) $\frac{x^4y^4 + 2xy^3 + x^2}{x^4y^6}$

3. Simplify $\frac{(2xy^2)^3}{(x^2y)^2}$

a) $6xy^4$

b) $8x^7y^8$

c) $\frac{6y^3}{x}$

d) $\frac{8y^3}{x}$

e) $\frac{8y^4}{x}$

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4. $16^{-\frac{1}{4}} \times 4^0 =$

- a) -2
- b) $\frac{1}{2}$
- c) 0
- d) $-\frac{1}{2}$
- e) 2

5. One factor of $3x^2 + 11x - 4$ is

- a) $3x+1$
- b) $x-4$
- c) $3x-1$
- d) $x-2$
- e) $3x+4$

6. Factor $x^2 + 2x - 8$

- a) $(x+2)(x-4)$
- b) $(x+8)(x-1)$
- c) $(x-8)(x+1)$
- d) $(x-2)(x+4)$
- e) $(x-4)(x-2)$

7. If $x^2 - 4x + 1 = 0$, then $x =$

- a) $2 + \sqrt{3}$, $2 - \sqrt{3}$
- b) $-2 + \sqrt{3}$, $-2 - \sqrt{3}$
- c) $2 + \sqrt{5}$, $2 - \sqrt{5}$
- d) $\sqrt{3}$, $-\sqrt{3}$
- e) None of the above.

8. If $|2x - 3| = 9$, then $x =$

- a) -6 or 3
- b) -6 or -3
- c) 6 or -3
- d) 6 or 3
- e) None of the above.

9. If $|x-3| > 5$, then

- a) $-2 < x < 8$
- b) $-8 < x < 2$
- c) $x < -8 \cup x > 2$
- d) $x < -2 \cup x > 8$
- e) $x < -8 \cup x > -2$

10. If $x^2 - 2x - 3 \leq 0$, then

- a) $x \leq -1 \cup x \geq 3$
- b) $x \leq -3 \cup x \geq 1$
- c) $-3 \leq x \leq 1$
- d) $1 \leq x \leq 3$
- e) $-1 \leq x \leq 3$

11. Solve the following pair of equations for x and y : $2x - y = 5$ and $4x + y = 7$

- a) $x = -2, y = 1$
- b) $x = 2, y = -1$
- c) $x = 1, y = -3$
- d) $x = -6, y = -17$
- e) $x = 2, y = 1$

12.
$$\frac{\frac{1}{xy} - 1}{\frac{1}{x^2} - \frac{y}{x}} =$$

- a) $\frac{y}{x}$
- b) $\frac{x}{y}$
- c) $\frac{1-xy}{x}$
- d) xy
- e) $xy-1$

13. $\frac{1}{2x+18} - \frac{x}{x^2-81} =$

a) $\frac{-1}{2(x-9)}$

b) $\frac{-3(x+3)}{2(x+9)(x-9)}$

c) $\frac{-1}{2(x+9)}$

d) $\frac{-9}{(x+9)(x-9)}$

e) $\frac{1-x}{(x-9)(x+7)}$

14. If $x = 11$ and $y = 25$, then $(x+y)^{-\frac{1}{2}} =$

a) 6

b) -6

c) $\frac{\sqrt{11}}{55}$

d) $\frac{1}{6}$

e) $-\frac{1}{6}$

15. Factor $16x^4 - 1$

a) $(2x-1)^2(2x+1)^2$

b) $(4x-1)^2(4x+1)^2$

c) $(2x-1)(2x+1)(4x^2+1)$

d) $(2x-1)(2x+1)(2x^2-1)$

e) $(2x-1)(2x+1)(2x^2+1)$

16. If $\frac{5}{x+2} = \frac{5-x}{x-2} + 1$, then $x =$

- a) 2
- b) -8
- c) 8
- d) -2
- e) None of the above.

17. If $f(x) = x^2 - 1$ then $f(x - 1) =$

- a) $x^2 - 2$
- b) $x^2 - 2x - 2$
- c) $x^2 - x$
- d) $x^2 - 2x$
- e) x^2

18. Let $x > 0$ and $f(x) = \sqrt{4x + 8}$ and $g(x) = x^2 - 2$. Evaluate $g(f(x)) - f(g(x)) =$

- a) x
- b) 0
- c) $6x + 6$
- d) $4x - 2$
- e) $2x + 6$

19. The graph of the equation $y = 4 - x$ is

- a) a parabola with vertex $(x, y) = (1, 4)$
- b) a parabola with vertex $(x, y) = (-1, 4)$
- c) a line with slope -1 and intercept 4
- d) a line with slope 4 and intercept -1
- e) a circle with radius 2

20. The graph of the equation $y^2 = 4 - x^2$ is

- a) a parabola with vertex $(x, y) = (1, 4)$
- b) a parabola with vertex $(x, y) = (-1, 4)$
- c) a line with slope -1 and intercept 4
- d) a line with slope 4 and intercept -1
- e) a circle with radius 2

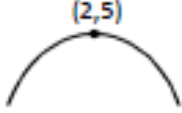
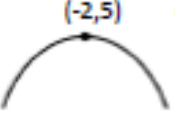
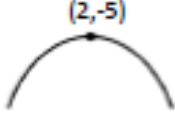
21. Find the equation of the straight line through points $(x, y) = (-2, 1)$ and $(x, y) = (1, -2)$.

- a) $y = x - 1$
- b) $y = x + 1$
- c) $y = -2x + 1$
- d) $y = 1 - x$
- e) $y = -x - 1$

22. Find the equation of the line perpendicular to $x + 3y = 4$ through the point $(x, y) = (1, 5)$.

- a) $3x - y = -2$
- b) $x + 3y = 16$
- c) $3x + y = 8$
- d) $x - 3y = -14$
- e) $3x + y = 4$

23. Which graph best represents the equation $y = -x^2 - 4x + 1$?

- a)  b)  c)  d)  e) 

24. The line $y = \frac{1}{2}x + 1$ intersects the parabola $y = x^2 - 4x + 3$ at

- a) $x = 4$ and $x = \frac{1}{2}$
- b) $x = 1$ and $x = \frac{1}{4}$
- c) $x = -\frac{1}{2}$ and $x = 4$
- d) $x = \frac{1}{2}$ and $x = \frac{1}{4}$
- e) None of the above.

25. The parabolas $y = x^2 + 2x + 2$ and $y = -2x^2 + 8x - 7$ intersect at points $(x, y) =$

- a) $(1, 1)$ and $(3, -2)$
- b) $(1, 1)$ and $(3, 17)$
- c) $(-1, 1)$ and $(3, -2)$
- d) $(-1, -1)$ and $(3, 17)$
- e) none of the above

26. After a 20% price decrease, the cost of an item is \$4.20. What was the original price?

- a) \$4.40
- b) \$5.04
- c) \$5.00
- d) \$4.96
- e) \$5.25

27. Adam can shovel a driveway in two hours. Bev can shovel the same driveway in three hours. How long would it take them working together?

- a) 2 hours 30 minutes
- b) 2 hours 20 minutes
- c) 48 minutes
- d) 1 hour 12 minutes
- e) 1 hour 36 minutes

28. A car leaves Regina at 1 PM and drives along Highway #1 at constant speed 85 km/h. A 2nd car leaves Regina at 1:30 PM and follows the same highway at constant speed 110 km/h. At what time will it pass the first car?

- a) 1:47 PM
- b) 2:07 PM
- c) 2:42 PM
- d) 3:12 PM
- e) 3:30 PM

29. A cell phone plan costs \$20 a month and includes 200 free minutes. Each additional minute costs 5 cents. Assume you use your cell phone for at least 200 minutes a month. If x is the total number of minutes a month, then your total cost C is given by

- a) $C = 10 + .05x$
- b) $C = 20x + .05$
- c) $C = 20 + .05x$
- d) $C = 20.05x$
- e) $C = 30 + .05x$

30. Find the area of the triangle that has sides with length 3, 4, and 5.

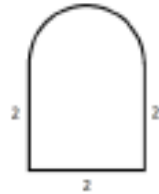
- a) 6
- b) 7.5
- c) 10
- d) 12
- e) 15

31. Find the distance between points $(x, y) = (-1, 2)$ and $(x, y) = (3, 4)$.

- a) 5
- b) $\sqrt{8}$
- c) $\sqrt{10}$
- d) $\sqrt{20}$
- e) $\sqrt{40}$

32. Find the total area of the given shape, a square with side length 2 topped by a semi-circle.

- a) $6 + \pi$
- b) $2 + \pi$
- c) $4 + 4\pi$
- d) $4 + \frac{\pi}{2}$
- e) $4 + \pi$



33. How many degrees is $\frac{\pi}{6}$ radians?

- a) 180
- b) 90
- c) 60
- d) 45
- e) 30

34. $\sin(60^\circ) =$

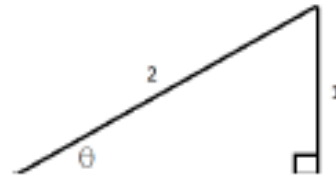
- a) 0
- b) $\frac{1}{2}$
- c) $\frac{\sqrt{2}}{2}$
- d) $\frac{\sqrt{3}}{2}$
- e) 1

35. $\cos\left(\frac{5\pi}{4}\right) =$

- a) $\frac{\sqrt{3}}{2}$
- b) $-\frac{\sqrt{3}}{2}$
- c) $\frac{\sqrt{2}}{2}$
- d) $-\frac{\sqrt{2}}{2}$
- e) None of the above.

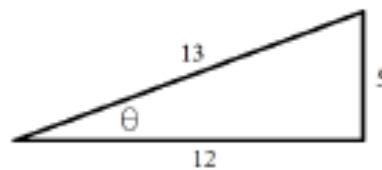
36. The angle θ (in radians) in the given diagram is

- a) $\frac{\pi}{8}$
- b) $\frac{\pi}{6}$
- c) $\frac{\pi}{4}$
- d) $\frac{\pi}{3}$
- e) $\frac{\pi}{2}$



37. In the given diagram, $\tan \theta =$

- a) $5/12$
- b) $5/13$
- c) $12/13$
- d) $12/5$
- e) $13/5$



38. Which of the following values is largest?

- a) $\sin(30^\circ)$
- b) $\sin(60^\circ)$
- c) $\sin(70^\circ)$
- d) $\sin(85^\circ)$
- e) $\sin(100^\circ)$

39. At what points in the interval $x \in [0, 2\pi]$ does $y = \sin(x)$ intersect $y = \cos(x)$?

- a) $x = \frac{\pi}{4}$ and $x = \frac{3\pi}{4}$
- b) $x = \frac{\pi}{4}$ and $x = \frac{5\pi}{4}$
- c) $x = \frac{3\pi}{4}$ and $x = \frac{5\pi}{4}$
- d) $x = \frac{\pi}{4}$ and $x = \frac{7\pi}{4}$
- e) $x = \frac{3\pi}{4}$ and $x = \frac{7\pi}{4}$

40. $\sin^2\left(\frac{\pi}{7}\right) + \cos^2\left(\frac{\pi}{7}\right) =$

- a) 0
- b) $\frac{\pi^2}{49}$
- c) 1
- d) $\frac{\pi}{7}$
- e) None of the above.

Good Luck!