

MSU Mathematics Placement Test

Sample Problems for Precalculus Mathematics

Answers to the following sample questions are given below. (You will have 45 minutes to do 25 problems on the actual test.)

1. $3(2^2 - 6) =$

- (a) -6 (b) 6 (c) 24 (d) 48

2. $8^{-2/3} =$

- (a) $16\sqrt{2}$ (b) $\frac{1}{4}$ (c) $5\frac{1}{3}$ (d) 4

3. If angle A is in the first quadrant and $\tan A = \frac{3}{4}$, then $\sec A =$

- (a) $\frac{4}{5}$ (b) $\frac{3}{5}$ (c) $\frac{5}{4}$ (d) 4

4. If $\sin x - \cos x = 0$ and $0^\circ \leq x \leq 180^\circ$, then $x =$

- (a) 45° (b) 90° (c) 135° (d) -1

5. $\log_2 8 =$

- (a) 16 (b) 9 (c) 4 (d) 3

6. The graph of $y = \sqrt{9 - x^2}$ is

- (a) a semicircle (b) an ellipse (c) a parabola (d) a point

7. The minimum value attained by $y = 3 \sin(4x + 5)$ is

- (a) 3 (b) 4 (c) 5 (d) -3

8. The slope of the straight line given by $2x + 3y = 4$ is

- (a) 2 (b) 3 (c) $\frac{3}{2}$ (d) $-\frac{2}{3}$

9. For a circle, circumference $C = 2\pi r$ and diameter $d = 2r$, where r is the circle's radius. Express C in terms of d . $C =$

- (a) $4\pi d$ (b) $2\pi d$ (c) πd (d) $\frac{\pi}{d}$

10. $\cos\left(\frac{3\pi}{4}\right) =$
- (a) $-\frac{\sqrt{2}}{2}$ (b) $\frac{1}{2}$ (c) $-\frac{1}{2}$ (d) $\frac{\sqrt{3}}{2}$
11. If $\log_4 x - \log_4(x-1) = \frac{1}{2}$ then the solution set for x is
- (a) $\{ \}$ (b) $\{2\}$ (c) $\{-1\}$ (d) $\left\{\frac{1-\sqrt{3}}{2}, \frac{1+\sqrt{3}}{2}\right\}$.
12. The solution to the equation $4^{2x-7} = 64$ is $x =$
- (a) 5 (b) $\frac{23}{2}$ (c) $\frac{71}{2}$ (d) 4
13. If $f(x) = x^2 - 3x + 4$ then $f(x+2) - f(2) =$.
- (a) $x^2 - 3x + 4$ (b) $x^2 + x$ (c) $x^2 + x - 8$ (d) $x^2 - 3x - 4$
14. Let $f(x) = x^2 - x - 1$ and $g(x) = 4x$. Find $f(g(x))$.
- (a) $x^3 - 4x^2 - 4x$ (b) $x^2 + 3x - 1$ (c) $16x^2 - 4x - 1$ (d) $4x^2 - 4x - 4$
15. Let $f(x) = 16 - x^2$ and $g(x) = 4 - x$. Find $\left(\frac{f}{g}\right)(x)$.
- (a) $-x^2 + x + 12$ (b) $-x^2 - x + 20$ (c) $x^3 - 4x^2 - 16x + 64$ (d) $4 + x$
16. Let $f(x) = 2\sqrt{x}$ and $g(x) = x - 4$. Find $g(f(9))$.
- (a) 2 (b) $2\sqrt{5}$ (c) 30 (d) 11
17. Which equation represents y as a function of x .
- (a) $x = 10$ (b) $\sin x + y^4 = 6$ (c) $y - 6x^2 = 7x$ (d) $3x = y^2$
18. Find the domain of the function $h(x) = \frac{5x^2 - 2x + 6}{x(x^2 - 64)}$.
- (a) All real numbers $x \neq \pm 8, 0$ (b) All real numbers $x \neq \pm 8$
(c) All real numbers $x \neq \pm 64, 0$ (d) All real numbers $x \neq 8$
19. The domain of the function $f(x) = \sqrt{16 - x^2}$ is
- (a) $0 \leq x \leq 4$ (b) $-4 \leq x \leq 4$ (c) All real numbers
(d) All real numbers $x \neq \pm 4$

20. $\cos^4 x - 2 \cos^2 x + 1 =$
 (a) $1 - \cos^2 x$ (b) 1 (c) $\cos^4 x$ (d) $\sin^4 x$
21. If $\sin x = -\frac{3}{5}$, then $\cos(2x) =$
 (a) $-\frac{18}{25}$ (b) $-\frac{4}{5}$ (c) $\frac{7}{25}$ (d) $\frac{4}{5}$
22. The expression $\log_4(x^3\sqrt{y})$ is equivalent to
 (a) $\log_4 x^3 - 2 \log_4 y$ (b) $3 \log_4 x + \frac{1}{2} \log_4 y$ (c) $3 \log_4 x - \frac{1}{2} \log_4 y$
 (d) $\log_4 x^3 + 2 \log_4 y$
23. Convert to degree measure: $\frac{5\pi}{12}$ radians.
 (a) 82° (b) 150° (c) 36° (d) 75°
24. Convert to radian measure: 240° .
 (a) $\frac{3\pi}{4}$ (b) $\frac{43,200}{\pi}$ (c) $\frac{3\pi}{2}$ (d) $\frac{4\pi}{3}$
25. Simplify $\csc^2 x - \cos^2 x \csc^2 x$.
 (a) $-\cos^2 x$ (b) $\sin^2 x$ (c) 1 (d) $\csc x$
26. Find all solutions of $\sin^2 x - \sin x = 0$, for $0 \leq x < 2\pi$. The sum of these solutions is
 (a) $\frac{7\pi}{2}$ (b) $\frac{3\pi}{2}$ (c) 3π (d) π
27. If $\sin \theta > 0$ and $\tan \theta < 0$, determine the quadrant in which θ lies.
 (a) I (b) II (c) III (d) IV
28. To obtain the height of a tree, you measure the tree's shadow and find that it is 20 feet long. You also measure the shadow of a 5-foot pole and find that it is 2 feet long. How tall is the tree?
 (a) 50 feet (b) 8 feet (c) 100 feet (d) 102 feet
29. Simplify the expression $2 - \ln e^{2x}$.
 (a) $2 - e^{2x}$ (b) $e^{2x} + 2$ (c) $2 - 2x$ (d) $2x - \ln 2$
30. Let i be the imaginary unit defined by $i = \sqrt{-1}$. Then $(1 + i)^2 - (2 - 3i)^2 =$
 (a) $5 + 14i$ (b) 5 (c) $5 + 8i$ (d) $-13 - 10i$

31. Find the solution of the equation $\frac{4}{k-1} - \frac{1}{k+4} = 0$.
- (a) -5 (b) $\frac{17}{5}$ (c) 3 (d) $-\frac{17}{3}$
32. Let i be the imaginary unit defined by $i = \sqrt{-1}$. Then $i^{57} =$
- (a) 1 (b) i (c) $-i$ (d) -1
33. The Solution set of the equation $\sqrt{x+25} - 5 = -x$ is
- (a) $\{0\}$ (b) $\{11\}$ (c) $\{-9, 11\}$ (d) $\{0, 11\}$
34. The solution set of the equation $|x^2 - 6x + 7| = 2$ is
- (a) $\{0, -4, -2\}$ (b) $\{1, 3, 5\}$ (c) $\{-2, -1\}$ (d) $\{2, 4, 6\}$
35. Solve the inequality $|x - 3| \leq 3$.
- (a) $x < 0, x > 6$ (b) $0 \leq x \leq 6$ (c) $x \leq 0, x \geq 6$ (d) $0 < x < 6$
36. Solve the inequality $x^2 + x - 12 > 0$.
- (a) $x < -3, x > 4$ (b) $-4 < x < 3$ (c) $x < -4, x > 3$ (d) $-3 < x < 4$
37. Find a function that has amplitude = 2 and period = 3π .
- (a) $y = 2 \sin \frac{2x}{3}$ (b) $y = \sin \frac{2x}{3}$ (c) $y = \sin 3\pi x$ (d) $y = 2 \sin \frac{\pi x}{3}$
38. $\arcsin\left(-\frac{\sqrt{3}}{2}\right) =$
- (a) $-\frac{\pi}{4}$ (b) $-\frac{\pi}{6}$ (c) 0 (d) $-\frac{\pi}{3}$

Answers:

1-a, 2-b, 3-c, 4-a, 5-d, 6-a, 7-d, 8-d, 9-c, 10-a, 11-b, 12-a, 13-b, 14-c, 15-d, 16-a, 17-c, 18-a, 19-b, 20-d, 21-c, 22-b, 23-d, 24-d, 25-c, 26-b, 27-b, 28-a, 29-c, 30-a, 31-d, 32-b, 33-a, 34-b, 35-b, 36-c, 37-a, 38-d