
MATH PLACEMENT TEST FOR ENGINEERING AND ARCHITECTURE
SAMPLE TEST#3

THIS SAMPLE PLACEMENT TEST IS ONLY FOR

Architecture/Interior Design majors
Computer Science majors
All Engineering majors
Environmental Science/Biology/Chemistry majors
Physics Majors
Mathematics majors

INSTRUCTIONS:

The test consists of 30 multiple-choice questions.
Only Scientific Calculators are allowed.
Duration of the exam is 90 minutes (around three minutes per question).

1. Factor completely the following Expression:

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

- A. $-3(x - 9)(x - 6)$
- B. $54(x - 9)(x + 6)$
- C. $15(x - 9)(x + 6)$
- D. $15(9 - x)(x + 6)$
- E. None of the above

2. Perform the following operation assuming that x, y and z are positive real numbers. Write the answer using positive exponents only:

$$\left(\frac{y^{10}z^4}{x^2}\right)^{-\frac{10}{3}}$$

- A. $\frac{x^{\frac{20}{3}}z^{\frac{40}{3}}}{y^{\frac{100}{3}}}$
- B. $\frac{x^{\frac{20}{3}}}{z^{\frac{40}{3}}y^{\frac{100}{3}}}$
- C. $\frac{y^{\frac{100}{3}}z^{\frac{40}{3}}}{x^{\frac{20}{3}}}$
- D. $x^{\frac{20}{3}}y^{\frac{100}{3}}z^{\frac{40}{3}}$
- E. None of the above

3. Simplify the following radical expression:

$$\sqrt[3]{16x^2y} \cdot \sqrt[3]{2x^2y}$$

- A. $2y\sqrt[3]{4x}$
- B. $2\sqrt[3]{4x^2y}$
- C. $2y\sqrt[3]{4x^2}$
- D. $2x\sqrt[3]{4xy^2}$
- E. None of the above

4. Rationalize the denominator of the following expression and simplify:

$$\frac{5 - \sqrt{x}}{5 + \sqrt{x}}$$

- A. $\frac{5 - 10\sqrt{x}}{25 - x}$
B. $\frac{25 - 10x + x^2}{5 - x}$
C. $\frac{25 - 10\sqrt{x} + x}{25 - x}$
D. $\frac{25 + 10\sqrt{x} + x}{25 - x}$
E. None of the above

5. Perform and simplify the following operation:

$$\frac{x^2 - 2x - 8}{x^3 + 2x^2} \times \frac{x^2 + x}{x^2 - 3x - 4}$$

- A. $\frac{x - 2}{x(x + 2)}$
B. x
C. $\frac{1}{x}$
D. $\frac{2x + 7}{(x^3 + 1)(3x + 4)}$
E. None of the above

6. Perform and simplify the following operation:

$$\frac{3}{x + 2} - \frac{2x + 18}{x^2 + 11x + 18}$$

- A. $\frac{x + 24}{x^2 + 11x + 18}$
B. $\frac{x - 16}{x^2 + 11x + 18}$
C. $\frac{1}{x - 2}$
D. $\frac{1}{x + 2}$
E. None of the above

7. Simplify the following complex fraction:

$$\frac{x - \frac{x}{x+3}}{x+2}$$

A. $\frac{x}{x-3}$

B. x

C. $\frac{x}{x+3}$

D. $\frac{x}{x+2}$

E. None of the above

8. Evaluate the following expression and write your answer in the form $a + ib$:

$$\frac{6 + 18i}{3i - 1}$$

A. $\frac{24 - 18i}{5}$

B. $\frac{-12 + 9i}{5}$

C. $\frac{30 - 18i}{5}$

D. $\frac{-24 + 18i}{5}$

E. None of the above

9. Solve the linear equation:

$$(x - 7) - (x + 4) = 4x$$

A. $x = -\frac{11}{2}$

B. $x = -\frac{11}{4}$

C. $x = \frac{11}{4}$

D. $x = -\frac{3}{4}$

E. None of the above

10. Solve the following equation:

$$|3 - 4x| + 8 = 12$$

A. $x = \frac{1}{4}, x = -\frac{7}{4}$

B. $x = -\frac{23}{4}$

C. $x = \frac{23}{4}$

D. $x = -\frac{1}{4}, x = \frac{7}{4}$

E. None of the above

11. Solve the following quadratic equation:

$$4x^2 = -16x - 7$$

A. $x = -\frac{1}{2}, x = -\frac{7}{2}$

B. $x = -\frac{1}{4}, x = 4$

C. $x = \frac{1}{2}, x = \frac{7}{2}$

D. No real solution

E. None of the above

12. Solve the following inequality, write your answer in Interval notation and graph it:

$$\frac{1}{4} < \frac{2x - 5}{8} \leq \frac{1}{2}$$

A. $\left[\frac{7}{2}, \frac{9}{2}\right]$



B. $\left(\frac{7}{2}, \frac{9}{2}\right]$



C. $\left[\frac{7}{2}, \frac{9}{2}\right)$



D. $\left(\frac{11}{2}, \frac{21}{2}\right]$



E. None of the above

13. Solve the following inequality and write your answer in Interval notation:

$$\frac{x}{x+1} > 3x$$

A. $\left(-1, -\frac{2}{3}\right) \cup (0, \infty)$

B. $(-\infty, -1] \cup \left[-\frac{3}{2}, 0\right)$

C. $(-\infty, -1) \cup \left(-\frac{2}{3}, 0\right)$

D. $(-\infty, \infty)$

E. None of the above

14. Write the equation of the line with x -intercept at -3 and y -intercept at 5 :

A. $5x - 3y = -30$

B. $5x - 3y = 24$

C. $3x - 5y = -15$

D. $5x - 3y = -15$

E. None of the above

15. Write the equation of the line passing through the points $(2, -3)$ and perpendicular to the line passing through the points $(3, 5)$ and $(-1, -5)$

A. $y = -\frac{2}{5}x - \frac{11}{2}$

B. $y = -\frac{2}{5}x + 5$

C. $y = \frac{5}{2}x - 8$

D. $y = -\frac{2}{5}x + \frac{4}{5}$

E. None of the above

16. Determine whether the equation below defines y as a function of x :

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

A. No

B. Yes

17. Find the domain of the following function:

$$f(x) = \frac{\sqrt{x}}{(x-11)(x-5)}$$

- A. $[0, 5) \cup (5, 11) \cup (11, \infty)$
- B. $(0, 5) \cup (5, 11) \cup (11, \infty)$
- C. $[0, \infty)$
- D. $(-\infty, \infty)$
- E. None of the above

18. Write the following quadratic function in vertex form and find its maximum or minimum value:

$$f(x) = -x^2 - 4x + 3$$

- A. $-(x+2)^2 + 7$, Minimum value $f(-2) = 7$
- B. $-(x+2)^2 + 7$, Maximum value $f(-2) = 7$
- C. $-(x-2)^2 + 7$, Minimum value $f(-2) = 7$
- D. $-(x-7)^2 - 2$, Maximum value $f(7) = -74$
- E. None of the above

19. Find the inverse of the following function:

$$f(x) = \frac{2-7x}{9-5x}$$

- A. $f^{-1}(x) = \frac{2-9x}{5x-7}$
- B. $f^{-1}(x) = \frac{9x-2}{5x-7}$
- C. $f^{-1}(x) = \frac{2-9x}{5x+7}$
- D. $f^{-1}(x) = \frac{2+9x}{5x+7}$
- E. None of the above

20. Write the following expression in Logarithmic form (do not solve):

$$e^{x+2} = 0.2y$$

- A. $x + 2 = \ln(0.2 + y)$
- B. $x + 2 = \log(0.2y)$
- C. $x + 2 = \ln(0.2y)$
- D. $x + 2 = e^{0.2}$
- E. None of the above

21. Find the domain of the following function:

$$f(x) = \ln(x^2 - 16)$$

- A. All real numbers
- B. All real numbers x such that $x \neq \pm 4$
- C. All real numbers x such that $x > 4$ or $x < -4$
- D. All real numbers x such that $-4 < x < 4$
- E. None of the above

22. Write the following expression as a single log:

$$\ln(6) - 5 \ln(x) + 9 \ln(x^2 + 9)$$

- A. $\ln\left(\frac{6(x^2 + 9)^9}{x^5}\right)$
- B. $\ln(6(x^2 + 9)^9) - x^5$
- C. $\ln(30x(x^2 - 9)^9)$
- D. $\ln\left(\frac{x^5}{6(x^2 + 9)^9}\right)$
- E. None of the above

23. Solve the following logarithmic equation:

$$\log_2(2x) = \log_2(3) + \log_2(x - 5)$$

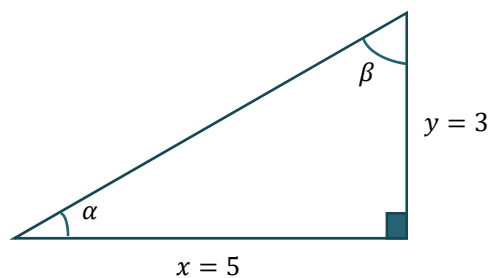
- A. $x = 3$
- B. $x = 15$
- C. $x = -3$
- D. $x = -15$
- E. None of the above

24. Solve the following Exponential Equation:

$$x^3 \times 9^x - 9^x = 0$$

- A. $x = -1$
- B. $x = 0$
- C. $x = 1$
- D. $x = 3$
- E. None of the above

25. Given the right angled triangle below, find $\sin(\alpha)$ and $\cos(\beta)$ if $x = 5$ and $y = 3$



- A. $\sin \alpha = \frac{3}{\sqrt{34}}$, $\cos \beta = \frac{3}{\sqrt{34}}$
- B. $\sin \alpha = \frac{5}{\sqrt{34}}$, $\cos \beta = \frac{3}{\sqrt{34}}$
- C. $\sin \alpha = \frac{3}{\sqrt{34}}$, $\cos \beta = \frac{5}{\sqrt{34}}$
- D. $\sin \alpha = \frac{5}{\sqrt{34}}$, $\cos \beta = \frac{5}{\sqrt{34}}$
- E. None of the above

26. Simplify the following trigonometric expression to its lowest form:

$$\frac{\csc x - \cot x}{\sec x - 1}$$

- A. $\cot x$
- B. $\tan x$
- C. $\sec x$
- D. 1
- E. None of the above

27. Find all the solutions of the following trigonometric equation in the interval $[0, \pi]$:

$$\tan x + \sec x = 1$$

- A. $x = \frac{\pi}{4}$
- B. $x = 5\frac{\pi}{4}$
- C. $x = 0$
- D. $x = -1$
- E. None of the above

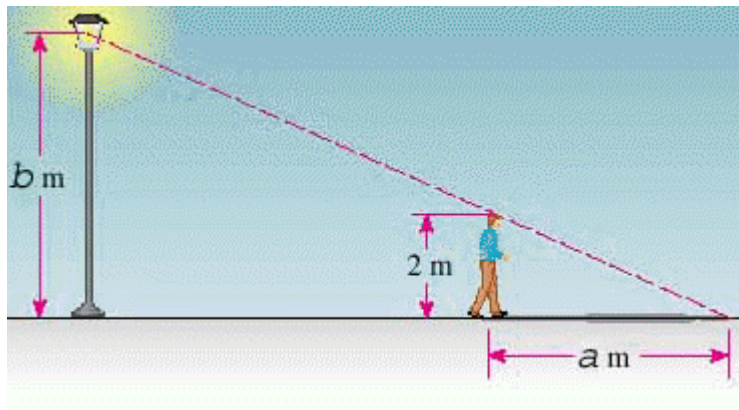
28. The height of a punted object is given by

$$h(x) = -\frac{1}{64}x^2 + \frac{21}{32}x + 3$$

where x is the horizontal distance in feet from the point where the object is punted. How far, horizontally, is the object from where it started when it is at its maximum height?

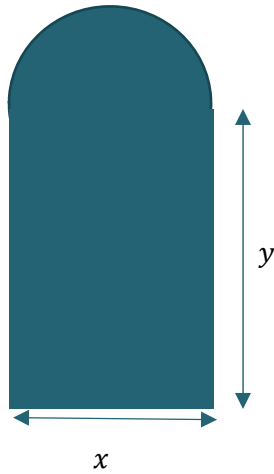
- A. 45 ft
- B. 26 ft
- C. 21 ft
- D. 24 ft
- E. None of the above

29. A man is walking away from a lamppost with a light source $b = 6$ meters above the ground. If the man is 2 meters tall, how far from the lamppost is he when his shadow is $a = 8$ meters long? [Hint: Use similar triangles.]



- A. 15 meters
- B. 24 meters
- C. 16 meters
- D. 14 meters
- E. 17 meters

30. A Norman window has the shape of a rectangle surmounted by a semicircle as in the figure below. If the perimeter of the window is $10m$, express the area, A , as a function of the width, x , of the window.



- A. $A(x) = \frac{20x - 2x^2}{4}$
- B. $A(x) = \frac{80x - 3\pi x^2 - 7x^2}{8}$
- C. $A(x) = \frac{40x - 3\pi x^2 + 7x^2}{8}$
- D. $A(x) = \frac{40x - 4x^2 - \pi x^2}{8}$
- E. None of the above

ANSWER KEY

Question#	Answer	Question#	Answer
1	C	16	A
2	B	17	A
3	D	18	B
4	C	19	B
5	C	20	C
6	D	21	C
7	C	22	A
8	A	23	B
9	B	24	C
10	D	25	A
11	A	26	A
12	B	27	C
13	C	28	C
14	D	29	C
15	A	30	D