

---

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.  
All types of calculators are NOT 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

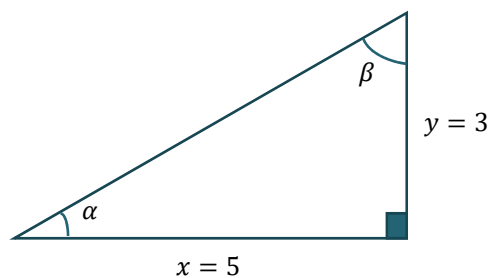


24. Solve the following Exponential Equation:

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

- 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

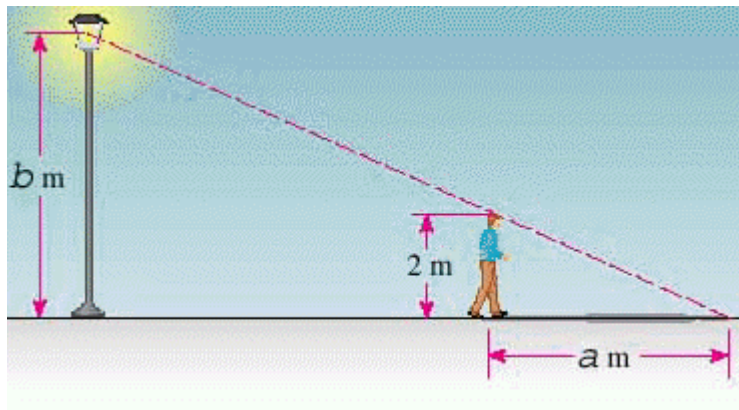
28. The height of a punted object is given by

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

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?

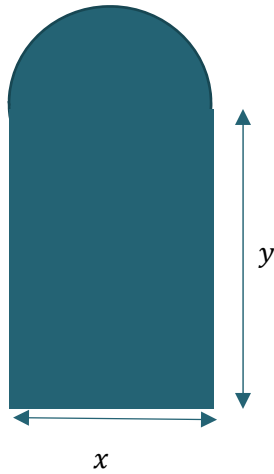
- A. 45 ft
- B. 26 ft
- C. 21 ft
- D. 24 ft
- E. None of the above

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