

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. If $0^\circ \leq x < 90^\circ$, then $\tan x \cos x$ simplifies to:

- A) $\sin x$ B) $\cos x$ C) $\cot x$ D) $\sec x$ E) $\csc x$

2. The expression $\frac{(x^4 y^{-3})^2}{x^3 y^5}$ simplifies to:

- A) $\frac{x^3}{y^6}$ B) $\frac{x^5}{y^{11}}$ C) $\frac{x^2}{y^{16}}$ D) $x^9 y^{-6}$ E) None of these.

3. If $f(x) = 2^x$, and a and b are any positive numbers, then $f(a+b)$ is equivalent to:

- A) $f(a) \cdot f(b)$ B) $\frac{f(a)}{f(b)}$ C) $f(a^b)$ D) $f(a) + f(b)$ E) None of these.

4. The domain of $g(x) = \frac{1}{\sqrt{3-x}}$ is:

- A) $[3, \infty)$ B) $(3, \infty)$ C) $(-\infty, 3]$ D) $(-\infty, 3)$ E) None of these.

5. The angle 150° in radian measure is given by:

- A) $\frac{5\pi}{12}$ B) $\frac{6}{5\pi}$ C) 75π D) $\frac{5\pi}{6}$ E) None of these.

6. Solve for x : $6.4x - 3.2 = 4.4x + 1.2$

- A) $x = -2.2$ B) $x = 2$ C) $x = -1$ D) $x = 1.1$ E) None of these.

7. One solution to the equation $3x^2 + x - 5 = 0$ is:

- A) $\frac{-1+i\sqrt{61}}{6}$ B) $\frac{1+i\sqrt{61}}{6}$ C) $\frac{-1+\sqrt{61}}{6}$ D) $\frac{1-\sqrt{61}}{6}$ E) None of these.

8. What is the number $(.01)^{-\frac{1}{2}}$ equal to?

- A) .01 B) 10 C) 1000 D) .1 E) 100

9. If $f(x) = x^2$ and $g(x) = x^3 + 2x$, what is the composition $(f \circ g)(x)$?

- A) $x^5 + 2x^3$ B) $(x^3 + 2x)^2$ C) $x^6 + 4x^2$ D) $\frac{x^3 + 2x}{x^4}$ E) None of these.

10. Solve $\log_{10}(x-1) = 2$ for x .

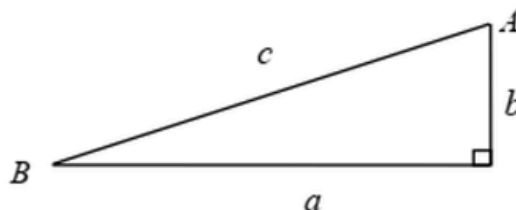
- A) 1025 B) 21 C) 101 D) 99 E) None of these.

11. The function $f(x) = \cot x$ is not defined for:

- A) $x = 0$ B) $x = \frac{\pi}{4}$ C) $x = \frac{\pi}{2}$ D) $x = \frac{\pi}{3}$ E) None of these.

12. In the right triangle shown, $a = 8$ and $c = 10$, find $\tan A$

- A) $\frac{5}{3}$ B) $\frac{3}{5}$ C) $\frac{3}{4}$
D) $\frac{4}{3}$ E) None of these.



13. One solution to the equation $\frac{x-4}{5x+15} = \frac{1}{x+3}$ is:

- A) 3 B) 1 C) -3 D) $2\sqrt{5} + 2$ E) None of these.

14. The expression $\frac{\frac{1}{b^2} + a^2}{\frac{1}{a^2} + b^2}$ simplifies to: (Ignore the domain change when simplified.)

- A) $\frac{1+a^4}{1+b^4}$ B) $\frac{b^2+a^2}{a^2b^2}$ C) $\frac{b^2}{a^2}$ D) $\frac{a^2}{b^2}$ E) None of these.

15. Find the equation of the line through the two points (5,3) and (-1,6).

- A) $y = \frac{1}{2}x + \frac{11}{2}$ B) $y = -\frac{1}{2}x + \frac{11}{2}$ C) $y = 2x + 8$
D) $y = -2x + 4$ E) None of these.

16. If $f(x) = 5x - 2$, the inverse function is:

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

17. $x^{-3} - y^{-3}$ is equivalent to:

- A) $(x-y)^{-3}$ B) $\frac{x^3y^3}{x^3-y^3}$ C) $\frac{1}{(x-y)^3}$ D) $\frac{y^3-x^3}{x^3y^3}$ E) None of these.

18. The expression $x^4y - xy^4$ may be factored as:

- A) $(x-y)(x^2 - y^2)(x^2 + y^2)$ B) $xy(x-y)^3$ C) $xy(x-y)(x^2 + xy + y^2)$

D) $(x^2 y - x y^2)^2$

E) None of these.

19. The exact value of $\cos \frac{4\pi}{3}$ is

A) $\frac{\sqrt{3}}{2}$

B) $-\frac{\sqrt{3}}{2}$

C) $\frac{1}{2}$

D) $-\frac{1}{2}$

E) None of these.

20. The expression $\log_2 2x - 2\log_2 y + \log_2 z$ is equivalent to:

A) $\log_2 \left(\frac{2xz}{y^2} \right)$

B) $\log_2 \left(\frac{xz}{y} \right)$

C) $\log_2 (2x - y^2 + z)$

D) $\frac{\log_2 2x \log_2 z}{2\log_2 y}$

E) None of these.

Good Luck!