MATH 1300: Diagnostic Exam

Name:

Directions: Circle the correct answer for each multiple choice problem below. This test should take you less than one hour.

1. $(x+3)^2 =$
   (a) x^2+3
   (b) x^2+9
   (c) x^2+6x+9
   (d) x^2+9x+9

2. $\left(\frac{x^{\frac{2}{3}}y^{\frac{3}{2}}}{x^2y}\right)^6 =$
   (a) y^8x^8
   (b) y^3x^{-8}
   (c) $4x^3y^8$
   (d) x^4y^{-2}

3. $\frac{x}{x+5} =$
   (a) $\frac{1}{5}$
   (b) $1+\frac{1}{5}$
   (c) 1
   (d) None of the above.

4. $\sin^2(\theta)+\cos^2(\theta) =$
   (a) 0
   (b) 1
   (c) $(\sin(\theta)+\cos(\theta))^2$
   (d) $\tan^2(\theta)$

5. $\frac{3}{4} + \frac{1}{3} - \frac{x}{6} =$

   (a) $\frac{13 - 2x}{12}$

   (b) $\frac{4 - x}{12}$

   (c) $4 - x$

   (d) None of the above.

6. $4^{\frac{3}{2}} =$

   (a) 6

   (b) 8

   (c) 64

   (d) None of the above.

7. If $\sin(\theta) = \frac{1}{2}$ and θ is in quadrant II, then $\cos(\theta) =$

   (a) $\frac{2\pi}{3}$

   (b) $-\frac{1}{2}$

   (c) $\frac{\sqrt{3}}{2}$

   (d) $-\frac{\sqrt{3}}{2}$

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

   (a) $\frac{-x^2}{y^2}$

   (b) $\frac{1}{x^2 y^2}$

   (c) $\frac{y^2}{x^2}$

   (d) None of the above.

9. Simplify $\frac{(x^2 + 2x - 3)(x + 2)}{(x + 2)(x - 1)}$.

   (a) $x + 3$

   (b) $\frac{x^3 + 4x^2 + x - 6}{x^2 + x - 2}$

   (c) $\frac{x^2 + 2x - 3}{x - 1}$

   (d) None of the above.

10. Simplify $\dfrac{4x^2+6x}{2x}$.

    (a) 5

    (b) $5x$

    (c) $2x+3$

    (d) None of the above.

11. $\cos\frac{2\pi}{3} =$

    (a) $\frac{1}{2}$

    (b) $\frac{-1}{2}$

    (c) $\frac{\sqrt{3}}{2}$

    (d) $\frac{-\sqrt{3}}{2}$

12. $\arctan(-1)$ may equal which of the following?

    (a) 1

    (b) $\frac{\pi}{4}$

    (c) $\frac{-\pi}{4}$

    (d) $\frac{\sqrt{2}}{2}$

13. Simplify the following expression: $\sqrt{49+\pi^2}$

    (a) $49+\pi$

    (b) $7+\pi$

    (c) $7-\pi$

    (d) The expression cannot be simplified further.

14. Simplify the expression: $\sqrt{\left(2x^2\sqrt{y}\right)^4}$

    (a) $\frac{4x}{y}$

    (b) $4x^2y^4$

    (c) $16xy^2$

    (d) $4x^4y$

    (e) $\sqrt[8]{\left(2x^2\sqrt{y}\right)}$

15. Simplify the expression: $\dfrac{\cos x}{\cos x\sin^2 x+\cos^3 x}$

    (a) $\cos x$

    (b) 1

    (c) $\frac{1}{\cos x}$

    (d) $\sin x$

16. Solve the equation $e^{4x-1} = 1$.

    (a) $\frac{1}{2}$
    (b) 0
    (c) $\frac{1}{4}$
    (d) $\ln \frac{1}{4}$
    (e) no solutions

17. Evaluate $\log_2 \frac{1}{16}$

    (a) 4
    (b) 8
    (c) -4
    (d) -8
    (e) 2

Short Answer

18. Find the equation for a circle with radius 3 and center $(-1, 2)$

19. Find the vertex of the parabola $y = 2x^2 + 3x - 5$

20. If an object makes 3 rotations per minute around a circle of radius 3 ft, determine its angular and linear velocities.

21. Two cars start at the same point. Car A heads due south at 60 km/h, while car B heads due east at 80 km/h. How far apart are the two cars after 2 hours?

22. A circular cone with a base radius of 12 cm and a height of 4 cm is turned upside down (standing on its vertex) and filled with water. What is the total volume of water when it has a depth of 6 cm? (Remember that the volume of a cone is given by $V = \frac{1}{3}\pi r^2 h$.)

23. A man is standing 8 ft from a light pole. At that point he is casting a 12 ft shadow. If the man is 6ft tall, how high is the light pole?

24. What is the y-intercept of the function $x^3 - 4x^2 + 12x - 25$

25. Find the solution to: $\left|\frac{5-3x}{4}\right| < 5$.

26. Find the distance between the two points $(-1, 2)$ and $(0, 4)$.

27. Find the slope of the line passing through the points $(-5, -2)$ and $(1, 4)$.

28. Factor: $2x^3 + 8x^2 - 3x - 12$

29. Solve the equation $\log_3(x+6) - \log_3(x-2) = 2$

30. The population of a certain species of bacteria is given by $P(t) = 500(1.3)^t$. How long will it take the population to double? (Do not use a calculator for this problem. Your answer should be in terms of logarithms and numbers)

31. Find an equation for a polynomial with zeros at $x = -2,\ x = 1,$ and $x = 3$.