ALGEBRA AND TRIGONOMETRY SELF-DIAGNOSTIC EXAM

<u>Do not</u> use a calculator, book, or notes for any part of the exam. The suggested time to complete the exam is 90 minutes; however, make sure to attempt every problem.

1. Simplify: $\dfrac{\left(x^2yz^{-2}\right)^3}{\left(xy^2z\right)^2}$

2. An equivalent algebraic expression to $m^{(4x-7y)}$ is:

3. Factor: $2y^4 - 32x^4$.

4. Simplify: $\dfrac{x}{x^2+5x+6} - \dfrac{2}{x^2+3x+2}$

5. After rationalizing the denominator of $\dfrac{3}{1-\sqrt{2}}$, an equivalent expression is:

6. Simplify: $\dfrac{\sqrt[5]{64x^5y^{-1}}}{\sqrt[5]{2y^4}}$

7. Simplify: $32^{4/5}$

8. Solve for x: $(x+a)(x-b) = x^2 - 1$

9. After clearing the numerator and denominator of fractions, $\dfrac{2x+\frac{1}{4}}{3x-\frac{1}{5}}$ is equivalent to:

10. Given: $1-5x = \sqrt{6x-7}$, find all real values of x which satisfy the equation.

11. The radius of a circular fountain is 10 ft. A sidewalk of uniform width is constructed around the outside of the fountain and has an area of 69π ft^2. How wide is the sidewalk?

12. A train leaves a station and travels north at a speed of 75 mph. Two hours later, a second train leaves on a parallel track traveling north at 125 mph. How far from the station will the faster train overtake the slower train?

13. Use "completing the square" to rewrite $x^2 - 4x + 3 = 0$ in the form $(x-c)^2 = d$.

14. Write an equation for y in terms of x assuming that y is proportional to x and $y = 42$ when $x = 6$.

15. Given the system of equations $\begin{cases} 4x + 2y = 14 \\ 2x - 8y = 8 \end{cases}$, find the value of y:

16. Given: $f(x) = 3 + x^2$, find $f(x+h) - f(x)$.

17. Given: $f(x) = \sqrt{x^2 - 9}$, find $f(x-3)$.

18. What is the domain of the function $y = \frac{5}{\sqrt{9-x}}$?

19. Find the slope-intercept form of the line through (1,4) and (3,-2).

20. Temperature T in degrees Fahrenheit is given by $T = \frac{9}{5}C + 32$ where C is temperature in degrees Celsius. What is the Celsius equivalent to 77°F?

21. Given $g(2) = 4$ and $f(x) = x/2$, find $f(g(2))$.

22. Find the point(s) of intersection of the curves $x^2 + y^2 = 1$ and $y + x = 0$.

23. Given $f(x) = -3x^2 - 18x - 15$, find the vertex and the maximum or minimum value.

24. Solve for x: $2 \le 5 - 2x \le 22$

25. Solve for x: $|3x - 2| - 6 \ge 0$

26. Solve for x: $x^2 - 35 \le 1$

27. Find the roots of $f(x) = (x^2 - 7x + 12)^2$ and state the multiplicity of each.

28. Solve for x: $e^{-4x} = e$.

29. Solve for x: $3^{4x+1} - 5 = 22$.

30. Is the point $(\frac{-\sqrt{35}}{6}, \frac{-1}{6})$ inside, outside, or on the unit circle?

31. Find z, given that:

$$\sin(z) = -\cos(z) \text{ and } \frac{3\pi}{2} \le z \le 2\pi$$

32. Given $f(x) = \sin(4x)$, find $f\left(\frac{\pi}{4}\right)$.

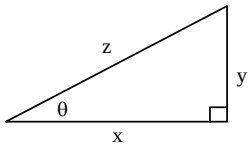
33. Given: $2\sin(x) = 1$, and $90° \le x \le 180°$. Find x.

34. Complete the trigonometric identity: $\sin(\pi - \theta) =$

35. Given sin(x) = -3/5 and x is in Quadrant III, find tan(x).

36. If a circle has radius 10 ft, what central angle θ corresponds to an arc of length 110π/6 ft?

37. In the figure, cot(θ) is defined by what ratio?



38. What is the period of $y = \sin(-2x)$?

39. Simplify the expression $\left(\dfrac{\cot\theta\sec\theta}{\csc^2\theta}\right)$:

40. Simplify the expression $(\sec t - \tan t)(\sec t + \tan t)$:

Self – Diagnostic Exam Solutions

1. $\frac{x^4}{yz^8}$
2. $\frac{m^{4x}}{m^{7y}}$
3. $2(y^2+4x^2)(y-2x)(y+2x)$
4. $\frac{x-3}{x^2+4x+3}$ or $\frac{x-3}{(x+1)(x+3)}$
5. $-3(1+\sqrt{2})$
6. $\frac{2x}{y}$
7. 16
8. $\frac{ab-1}{a-b}$
9. $\frac{40x+5}{60x-4}$
10. There are no real solutions
11. 3 feet
12. 375 miles
13. $(x-2)^2=1$
14. $y=7x$
15. $-\frac{1}{9}$
16. $2xh+h^2$
17. $\sqrt{x^2-6x}$
18. All x less than 9
19. $y=-3x+7$
20. 25^oC
21. 2
22. $(-\frac{\sqrt{2}}{2},\frac{\sqrt{2}}{2})$ and $(\frac{\sqrt{2}}{2},-\frac{\sqrt{2}}{2})$
23. Vertex : $(-3,12)$; maximum : 12
24. $-\frac{17}{2}\le x\le\frac{3}{2}$
25. $x\ge\frac{8}{3}$ or $x\le-\frac{4}{3}$
26. $-6\le x\le 6$
27. Roots : 3 and 4; each has multiplicity 2
28. – 0.25
29. 0.5
30. The point is on the unit circle
31. $\frac{7\pi}{4}$
32. 0
33. 150^o
34. $\sin(\theta)$
35. $\frac{3}{4}$
36. $\frac{11\pi}{6}$
37. $\frac{x}{y}$
38. π
39. $\sin(\theta)$
40. 1

Problems Numbered:	Topics Covered:
1-7	Basic concepts of Algebra
8-15	Equations, Inequalities, and Problem Solving
16-22	Functions and Graphs
23-27	Polynomial and Rational Functions
28-29	Exponential and Logarithmic Functions

30-40	Trigonometric Functions and Identities