Calculus Placement Test
(Used with permission from University of Michigan)

INSTRUCTIONS: Circle the correct answer for each of the following 25 questions. Calculators are NOT allowed for this pretest.

1. \[ \frac{|-1|^2 + |-1|^3}{1 - (-1)} = \]
   a) \(-2\)  
   b) \(-1\)  
   c) \(-\frac{1}{2}\)  
   d) 0  
   e) 1

2. Suppose \(x - 2y = 5\) and \(2x + y = 0\). Then \(x + y = \)
   a) 3  
   b) \frac{1}{2}  
   c) -1  
   d) 0  
   e) -5

3. Which of the following equals \((x^2 + 1)^3\)?
   a) \(x^6 + 1\)  
   b) \(x^4 + 2x^2 + 1\)  
   c) \(x^6 + 3x^4 + 3x^2 + 1\)  
   d) \(x^6 + 2x^3 + 1\)  
   e) \(x^3 + 3x^2 + 3x + 1\)

4. Which of the following is equivalent to \(\frac{2a + 3}{\frac{a}{2} + \frac{1}{3}}\)?
   a) \(\frac{2a^2 + 15a + 18}{3a}\)  
   b) \(\frac{6a^2 + 9a}{2}\)  
   c) \(\frac{1}{2}\)  
   d) \(\frac{6a^2 + 9a}{a + 6}\)  
   e) \(2a^2 + 3a\)

5. What is the distance between the points \((1, -1)\) and \((-1, 1)\)?
   a) 2  
   b) \(2\sqrt{2}\)  
   c) 4  
   d) 0  
   e) \(\sqrt{2}\)

6. What is the range of the function \(f(x) = x^4 - 16\)?
   a) \((-2, \infty)\)  
   b) \([-2, \infty)\)  
   c) \([-16, \infty)\)  
   d) \((-\infty, 2)\)  
   e) \((-\infty, \infty)\)

7. \(\sqrt{(-a)^2 \sqrt{a^2}} = \)
   a) \(-a^2\)  
   b) \(a\)  
   c) \(\sqrt{a}\)  
   d) \(-a\)  
   e) \(a^2\)

8. A right triangle has hypotenuse of length 12 and one leg of length 5. What is the length of the other leg?
   a) 13  
   b) \(\sqrt{104}\)  
   c) \(\sqrt{119}\)  
   d) 7  
   e) \(\sqrt{7}\)
9. If \( g(x) = 4x^2 + 3 \) and \( f(x) = 3x - 1 \), then \( f(g(x)) = \)
a) \( 36x^2 - 24x + 7 \)   b) \( 12x^2 - 3 \)   c) \( 36x^2 + 7 \)
d) \( 12x^2 + 8 \)   e) \( 12x^3 - 4x^2 + 9x - 3 \)

10. Which of the following is equivalent to \( \frac{z^{2n-1}}{2z^2} \)?
a) \( \frac{1}{2}z^{2n-1} \) b) \( \frac{1}{2}z^{2n-3} \) c) \( 2z^{-1} \)
d) \( \frac{1}{2}z^{2n+1} \)   e) \( \frac{1}{2}z^{1-2n} \)

11. Which of the following equals \( \frac{(1 + \sqrt{a})^2}{1 - \sqrt{a}} \)?
a) \( \frac{1 - a\sqrt{a}}{1 + a} \) b) \( \frac{1 + \sqrt{a} + a + a\sqrt{a}}{1 - a} \) c) \( \frac{1 + \sqrt{a}}{1 - a} \)
d) \( \frac{1 + 3\sqrt{a} + 3a + a\sqrt{a}}{1 - a} \)   e) \( \frac{1 + a^3}{1 - a^2} \)

12. If \( f(x) = \log_4 x \), then \( f(8) = \)
a) \( \frac{3}{2} \) b) \( \frac{2}{3} \) c) \( \frac{1}{2} \) d) \( 2 \) e) \( -\frac{1}{2} \)

13. The slope of the line having equation \( 5x + 3y - 7 = 0 \) is
a) \( -\frac{4}{5} \) b) \( -\frac{5}{3} \) c) \( \frac{3}{5} \) d) \( \frac{5}{3} \) e) \( \frac{7}{3} \)

14. Which of the following is equivalent to \( \frac{x^4 + 3x^2 + 2}{x^4 + 2x^2 + 1} \)?
a) \( \frac{x^2 + 2}{x^2 - 1} \) b) \( \frac{x^2 + 2}{x^2 + 1} \) c) \( \frac{x + 1}{x^2 + 1} \)
d) \( \frac{x + 2}{x^2 + 1} \) e) \( \frac{3x^2 + 2}{2x^2 + 1} \)

15. Find all values of \( y \) that satisfy \( |1 - 2y| \leq 5 \).
a) \( [-4, 6] \) b) \( [-\frac{5}{2}, \frac{5}{2}] \) c) \( [-2, 3] \)
d) \( [2, 3] \) e) \( (-\infty, 3] \)

16. If \( \frac{1}{2x} + \frac{1}{6x} = 1 - \frac{7}{3x} \), then \( x^2 + x = \)
a) \( 1 \) b) \( 2 \) c) \( 4 \) d) \( 12 \) e) \( 30 \)
17. The perimeter of a rectangle is six times its width. If the length of the rectangle is 30 inches, what is its perimeter in inches?
   a) 180  b) 120  c) 175  d) 90  e) 150

18. If \(8^x = \frac{7}{\sqrt{98}}\), then \(x =\)
   a) 1  b) \(-\frac{1}{2}\)  c) \(-\frac{1}{6}\)  d) \(\frac{1}{2}\)  e) \(\frac{1}{6}\)

19. A line with the equation \(y = mx + b\) passes through the point (1, -1) and is parallel to the line with equation \(y = -x - 5\). Then \(m + b =\)
   a) 0  b) 1  c) -1  d) 5  e) -5

20. A water tank is initially \(\frac{2}{3}\) full. After adding 8 gallons of water it is \(\frac{3}{4}\) full. What is the capacity of the tank in gallons?
   a) 12  b) 96  c) 32  d) 66\(\frac{2}{3}\)  e) 64

21. Suppose that the line with equation \(y = mx + b\) passes through the points (3, 5) and (8, 1). Then \(m + b =\)
   a) \(-\frac{4}{5}\)  b) \(\frac{43}{4}\)  c) \(\frac{3}{4}\)  d) \(\frac{43}{5}\)  e) \(-\frac{11}{4}\)

22. The domain of the function defined by the formula \(f(x) = \frac{x^2 - 1}{2x^3}\) is
   a) all real numbers except 0  b) all real numbers except 1
   c) all real numbers except \(\pm 1\)  d) all real numbers > 0
   e) all real numbers except \(\frac{1}{2}\)

23. Which of the following equals \(\frac{e}{(e^{-1} - e^{-2})^{-2}}?\)
   a) \(e^3 - e^5\)  b) \(e^{-1} - e^{-3}\)  c) \(e^3 - 2e^4 + e^5\)
   d) \(e^{-2} - 2 + e^{-3}\)  e) \(e^{-1} - 2e^{-2} + e^{-3}\)

24. Given that \(\frac{1}{a} - \frac{1}{b} = 4\) and \(\frac{1}{a} + b = 6\), then \(b =\)
   a) 5  b) 1  c) \(\frac{1}{5}\)  d) -1  e) -5

25. David is twice as old as Mark. Nine years ago, David was three times as old as Mark was then. What is the sum of the present ages of David and Mark, in years?
   a) 36  b) 30  c) 54  d) 48  e) 63