Sample Placement Exam 2

Name________________________________________
(print name)

I have neither given nor received aid on this exam, nor will I discuss it with anyone until all students have taken the departmental exam.

Pledged________________________________________

No calculators are allowed on the Placement Exam.

1. Find the equation of the line containing the point (-2, 1) and parallel to the curve 2y - 3x = 5.
   
   a. \( y = \frac{2}{3}x + \frac{7}{3} \)
   
   b. \( y = \frac{3}{2}x - 2 \)
   
   c. \( y = -\frac{2}{3}x - \frac{1}{3} \)
   
   d. \( y = \frac{3}{2}x + 4 \)
   
   e. none of these

2. What is the numerator when the denominator is rationalized: \( \frac{2}{h - \sqrt{h^2 - 4}} \)

   a. \( 3h - 2 \)
   
   b. \( 2h + \sqrt{h^2 - 4} \)
   
   c. \( h + 2\sqrt{h^2 - 4} \)
   
   d. \( h + \sqrt{h^2 - 4} \)
   
   e. none of these

3. Multiply: \((x - 1)^2(2x^2 - x + 1)\)

   a. \( 2x^4 + 3x^3 - 3x^2 + x + 1 \)
   
   b. \( 2x^4 - 5x^3 + 5x^2 - 3x + 1 \)
   
   c. \( 2x^4 - x^3 - x^2 + x - 1 \)
   
   d. \( 2x^4 - x^3 + 3x^2 - x + 1 \)
   
   e. none of these

4. For the piecewise function \( f(x) = \begin{cases} -5 & \text{if } x < -2 \\ 2 & \text{if } -2 \leq x < 2 \\ x + 1 & \text{if } x \geq 2 \end{cases} \), find the value of:

   \( 2f(-3) - f(2) = \)

   a. -13
   
   b. -11
   
   c. -8
   
   d. -7
   
   e. none of these
5. Which of the following is a factor of \( y + 5x + 3a + 15ax \).

a. \( x + a \)  
   b. \( y + 5 \)  
   c. \( x + y \)  
   d. \( 3a + y \)  
   e. none of these

6. Simplify: \( \left( \frac{27x^{-4}y^{-3}z^{3}}{x^{5}y^{0}z^{-3}} \right)^{-\frac{1}{3}} \)

a. \( \frac{3}{x^{2}y^{3}} \)  
   b. \( -3x^{3}y \)  
   c. \( \frac{x^{3}y^{3}}{3z^{2}} \)  
   d. \( -3x^{3}y^{3} \)  
   e. none of these

7. When \( \frac{(2x+1)^{\frac{1}{3}}(2-x)(3)(2x+1)^{\frac{2}{3}}}{2x+1} \) is expressed in simplified form the numerator is:

a. \( 3x - 1 \)  
   b. \( 3x + 5 \)  
   c. \( 5 + 5x - 2x^{2} \)  
   d. \( 1 + 5x - 2x^{2} \)  
   e. none of these

8. Solve for \( x \): \( 4x^{2} - 2x - 3 = 0 \)

a. \( -1 \pm \sqrt{13} \)  
   b. \( -2 \pm \sqrt{13} \)  
   c. \( 1 \pm \sqrt{13} \)  
   d. \( 1 \pm 2\sqrt{13} \)  
   e. none of these

9. Express as a single radical. \( \frac{5}{\sqrt[4]{(x - 2)^{3}}} \cdot \sqrt{x - 2} \)

a. \( 24\sqrt[4]{(x - 2)^{3}} \)  
   b. \( 20\sqrt[4]{(x - 2)^{3}} \)  
   c. \( 11\sqrt[4]{(x - 2)^{6}} \)  
   d. \( 10\sqrt[4]{(x - 2)^{7}} \)  
   e. none of these

10. State the range of the function \( f(x) = \sqrt{x - 2} + 1 \) in interval notation.

a. \( (-\infty, \infty) \)  
   b. \([0, \infty) \)  
   c. \([1, \infty) \)  
   d. \([2, \infty) \)  
   e. none of these
11. Divide and simplify: \( \frac{x^2 + 2xy + y^2}{x^3 - y^3} + \frac{2x^2 + xy - y^2}{x^2 - y^2} \)

   a. \( \frac{(x+y)^2}{(2x-y)(x^2-xy+y^2)} \)  
   b. \( \frac{x^2-y^2}{(x^2-xy+y^2)(2x-y)} \)  
   c. \( \frac{(x+y)^2}{(x^2+xy+y^2)(2x-y)} \)  
   d. \( \frac{(x+y)^2}{(x-y)^2(x^2+xy+y^2)} \)  
   e. none of these

12. Solve for x: \( \frac{x - 3}{x (2-x)} \geq 0 \)

   a. \((-\infty, 0) \cup (2,3]\)  
   b. \([0,2) \cup [3,\infty) \)  
   c. \((-\infty,0) \cup (0,2) \)  
   d. \([3,\infty) \)  
   e. none of these

13. Simplify: \( \frac{2 - 2 - x^2}{x^1 - 2^{\frac{1}{2}}} \)

   a. \( \frac{x + 2}{2x} \)  
   b. \( -\frac{(x+2)}{2x} \)  
   c. \( -(x+2) \)  
   d. \( \frac{x - 2}{4-x} \)  
   e. none of these

14. When \( \frac{x - 3}{x^2 + 3x} - \frac{4x}{x^2 - 9} \) is simplified the numerator is:

   a. \(-3(x-1)\)  
   b. \(-(x-9)\)  
   c. \(-\left(9+3x^2\right)\)  
   d. \(1-4x\)  
   e. none of these

15. Find the slope intercept form of the line that passes through the points \((-4,1)\) and \((4,-5)\).

   a. \( y = -\frac{1}{2}x + 7 \)  
   b. \( y = \frac{3}{4}x + 8 \)  
   c. \( y = -\frac{3}{4}x - 2 \)  
   d. \( y = -\frac{3}{4}x - 8 \)  
   e. none of these
16. Solve: \( 2 - 4x + 5 < 12 \)
   
   a. \(-\frac{11}{4}, \frac{11}{4}\)  
   b. \(-\infty, -\frac{11}{4}\) \(\cup\) \(\left(\frac{11}{4}, \infty\right)\)  
   c. \(-\frac{11}{4}, \frac{11}{4}\)  
   d. \(-\infty, -\frac{11}{4}\) \(\cup\) \(\left(\frac{11}{4}, \infty\right)\)  
   e. none of these

17. What is the remainder when \(3a^3 + 2a^2 - 3a - 1\) is divided by \(a - 2\) ?
   
   a. -25  
   b. -11  
   c. 11  
   d. 49  
   e. none of these

18. Solve: \(2x^2 - 3x \geq 5\)
   
   a. \((-\infty, -1] \cup \left[\frac{5}{2}, \infty\right)\)  
   b. \((-\infty, -\frac{5}{2}] \cup [1, \infty)\)  
   c. \([-1, \frac{5}{2}]\)  
   d. \((-\infty, 0] \cup \left[\frac{3}{2}, \infty\right)\)  
   e. none of these

19. How many real roots does the following polynomial have: \(x^5 - 2x^4 - x + 2 = 0\)
   
   a. 0  
   b. 1  
   c. 3  
   d. 5  
   e. none of these

20. Express the domain of \(f(x) = \frac{\sqrt{x + 3}}{x^2 - 2x - 8}\) in interval notation.
   
   a. \([-3, 2) \cup (2, 4) \cup (4, \infty)\)  
   b. \((-\infty, -3) \cup (-3, -2) \cup (-2, 4) \cup (4, \infty)\)  
   c. \((-\infty, -2) \cup (-2, 4) \cup (4, \infty)\)  
   d. \([-3, -2) \cup (-2, 4) \cup (4, \infty)\)  
   e. none of these

21. Find all solutions for the following equation on the interval \([0, 2\pi)\).
   \[2\cos^2 x = \sin x + 1\]
   
   a. \(\frac{\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}\)  
   b. \(\frac{\pi}{3}, \frac{5\pi}{3}\)  
   c. \(\frac{2\pi}{3}, \frac{3\pi}{2}\)  
   d. \(\frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}\)  
   e. none of these
22. Given \( \sec \theta = \frac{x}{4} \) and \( \frac{\pi}{2} < \theta < \pi \) which of the following is true?

a. \( \sin 2\theta = \frac{8(x^2 - 16)}{x^2} \)  
   b. \( \cos 2\theta = \frac{x^2 - 32}{x^2} \)  
   c. \( \sin 2\theta = \frac{2\sqrt{x^2 - 16}}{x} \)  

d. \( \cos 2\theta = \frac{16}{x^2} \)  
e. none of these

23. What is the domain of the tangent function?

a. All real numbers except those between \(-1\) and 1  
b. All real numbers except \( \frac{\pi}{2} + k\pi \) where \( k \) is an integer  
c. All real numbers except \( k\pi \) where \( k \) is an integer  
d. All real numbers  
e. All real numbers between 0 and \( 2\pi \)

24. Simplify: \( \frac{1}{\sec x} (\tan x + \cot x) \)

a. \( \cos x \)  
b. \( \frac{1}{\sin x \cos^2 x} \)  
c. \( \csc x \)  
d. \( \csc x \sec x \)  
e. none of these

25. Complete the square of the following expression: \( 16x^2 - 16x + 32 \)

a. \( (x - \frac{1}{2})^2 + \frac{7}{4} \)  
b. \( 16(x - \frac{1}{2})^2 - 2 \)  
c. \( 16(x - \frac{1}{2})^2 + 28 \)  
d. \( (x + \frac{1}{2})^2 + \frac{7}{4} \)  
e. none of these