MAT 1050 GROUP FINAL EXAM – WINTER 2004

SHOW ALL WORK. DO NOT USE A CALCULATOR

1. (7 pts.) Simplify by adding (or subtracting) like terms wherever possible:
   \[ a^b - 2b^a + 3\sqrt{x+1} - k\sqrt{x+1} + 4b^a + a^c \]

2. (7 pts.) Simplify completely:
   \[ \frac{\sqrt[4]{m^5 n^3 p^0}}{\sqrt[4]{32m^2 p^4}} \cdot \sqrt[4]{2m^5 n} \]

3. (7 pts.) Simplify completely:
   \[ \left( \frac{3^{-2}}{3^0 \cdot 3^{-1} + 3^{-2}} \right)^{\frac{1}{2}} \]

4. (7 pts.) Simplify completely:
   \[ \left( \frac{\frac{2}{8^{3}} - \frac{6}{8^{3}}}{\frac{1}{8^{3}} + \frac{8}{8^{3}}} \right)^{3} \]

5. (6 pts.) Let \( f(x) = 3 - 2|3x - 1| \). Find all \( x \) such that \( f(x) \leq -1 \).

6. (6 pts.) Solve:
   \[ 3\left| \frac{2x + 1}{3} \right| + 7 \geq 5 \]

7. (7 pts.) The perimeter of a triangular garden is 60 feet. Find the length of the three sides if one side is 4 feet greater than twice the length of the smallest side, and the third side is 4 feet less than 3 times the length of the smallest side.

8. (7 pts.) Solve for \( A \):
   \[ \frac{A + B}{AB} = \frac{2}{A} + 1 \]

9. (6 pts.) Let \( H \) be the function given by \( H(x) = \frac{4x - 9x^3}{\sqrt[3]{x + 1}} \).

   What is the domain of \( H \)?

10. (6 pts.) Let \( g \) be the function given by \( g(x) = -x^2 + 5|1 - x| \).

    Find and simplify \( 2g(-3) - 3g(2) \).
11. (7 pts.) Let $f$ be the function given by $f(x) = x^2 - 2x - 3$.

Find and simplify $\frac{f(x + 1) - f(x - 1)}{1 - x}$.

12. (6 pts.) Find the equation of the line that is perpendicular to the line $3x - 2y = 7$ and has an $x$-intercept of 6.

13. (6 pts.) Find the equation of the line containing the points $(-1,5)$ and $(-1,-3)$.

14. (7 pts.) The length of a rectangle is 2 cm more than its width. If the area of the rectangle is $35 \text{ cm}^2$, find the length of the **diagonal** of the rectangle.

15. (7 pts.) Solve, writing any non-real solutions in the form $a + bi$ : $x^2(x^2 + 4) = -2x^3$.

16. (7 pts.) Graph, labeling the vertex and all $x$ and $y$ intercepts: $f(x) = -x^2 + 6x$

17. (7 pts.) Simplify completely: $\frac{5a}{a-1} + \frac{2}{a} - \frac{3}{2a}$

18. (7 pts.) Solve: $\sqrt{1-x} - \sqrt{-2x - 7} = 0$

19. (7 pts.) Solve: $x(x - 5) \geq 6$

20. (7 pts.) Solve: $\frac{x + 8}{x + 2} \geq 1$

21. (7 pts.) The graph of a function, $f$, is shown here.

   a) What is the domain of $f$?
   
   b) What is $f(-5)$?
   
   c) For what input(s), $x$, is $f(x) = -1$?

22. (7 pts.) Solve: $2\left(\frac{x}{x - 1}\right)^2 + 3\left(\frac{x}{x - 1}\right) - 2 = 0$
23. (6 pts.) Find: a) $\log_2 (8)$  
   b) $\log_{\sqrt{8}} (\sqrt{8})$  
   c) $\log_{81} (3)$

24. (6 pts.) Using the approximate values $\log_5 (6) = 1.1$ and $\log_5 (10) = 1.4$ find:
   a) $\log_5 (30)$  
   b) $\log_5 (1000)$  
   c) $\log_5 (0.6)$

25. (7 pts.) Solve: $\log_5 (1 - y) + \log_5 (1 - y) = \log_5 (6)$

26. (7 pts.) Identify and sketch the curve given by $x^2 + y^2 - 2y = 8$. 

27. (7 pts.) Arrange the following numbers in order from smallest to largest:
   $\sin(175^\circ)$, $\cos(175^\circ)$, $\pi$, $\log_3 (\pi)$

28. (6 pts.) Convert to degrees:
   a) $\frac{\pi}{9}$ radians  
   b) $-\frac{2}{5}$ radians

29. (6 pts.) For the right triangle shown here, find:
   a) $\sin(\angle A)$
   b) $\tan(\angle B)$
   c) $\cos(\angle A)$

30. (7 pts.) Gerald drove 120 miles to his parent’s home. His return trip took 1 hour less because he drove 20 mph faster. How fast did Gerald drive going to his parent’s house?