MATH 0995 GROUP FINAL EXAM WINTER 2003

SHOW ALL WORK. DO NOT USE A CALCULATOR

1. (6 pts.) Simplify by adding (or subtracting) like terms wherever possible:

\[
\frac{2}{7^3} + 5\sqrt{3} + \frac{2}{2^3} - 5\cdot \frac{2}{7^3} + 4^3 + 2^3 - \pi \sqrt{3}
\]

2. (7 pts.) Simplify completely:

\[
\frac{125^2}{8^3} \left( \frac{4}{3^3} \right)^{\frac{1}{2}}
\]

3. (7 pts.) Simplify completely:

\[
\sqrt{\frac{36^{-1}}{2^{-2}}} - \frac{2^{-2}}{\sqrt{36^{-1}}}
\]

4. (6 pts.) Solve:

\[
1 - \frac{x - 3}{3} = 5(x - 2) - \frac{x}{6}
\]

5. (7 pts.) Solve for \(c\):

\[
\frac{2}{ac} = \frac{3}{bc} - \frac{3}{4b}
\]

6. (7 pts.) Find three consecutive even numbers such that 3 times the second number is 8 more than the sum of the first number and the third number.

7. (7 pts.) Simplify completely:

\[
\left( \frac{-2x^3 y}{y^0 z^1} \right)^{-2} \left( x^5 y^{-6} z^3 \right)
\]

8. (6 pts.) Solve and graph the solution set:

\[5(3y - 5) \leq 25y - 12\]

9. (7 pts.) The graph of a function, \(f\), is shown here.

a) What is the domain of \(f\) ?

b) For which input(s), \(x\), is \(f(x) = 0\) ?

c) What is \(f(-4)\) ?

10. (6 pts.) Let \(f\) be the function given by \(f(x) = |x + 2| + \frac{\sqrt{2x + 4}}{4}\). What is the domain of \(f\) ?

11. (7 pts.) Graph the function \(h(x) = x^3 - 1\). Label all intercepts.

12. (6 pts.) Let \(g(x) = \frac{2x^2 + x}{2x^2}\). Find and simplify \(2g(1) + 3g(-1)\).
13. (7 pts.) Find the equation of the line that is parallel to the line $x = -2$ and goes through the point $(2,5)$.

14. (6 pts.) Find the equation of the line that is perpendicular to the line $3x - 6y = 3$ and goes through the point $(-1,0)$.

15. (7 pts.) Carlos goes to the bank and gets change for a $50 bill consisting of all $1 and $5 bills. There are 22 bills in all. How many of each kind are there?

16. (7 pts.) Solve:

\[
\begin{align*}
2x + 8y &= 3 \\
x &= 8 - 4y
\end{align*}
\]

17. (6 pts.) Factor completely: $6x^3 + 10x^2 - 16x$

18. (6 pts.) Solve: $(x - 5)(x + 1) = -9$

19. (7 pts.) Simplify:

\[
\frac{16x^2}{8x^3 - 8x^2 - 16x}
\]

20. (7 pts.) Solve:

\[
\frac{x - 2}{x + 1} + \frac{3}{x^2 + 4x + 3} = \frac{x - 1}{x + 3}
\]

21. (7 pts.) Kelley can ride her bicycle 10 km in the same time that Megan can ride 15 km. If Megan rides 10 km/hour faster than Kelley, how fast does each person ride?

22. (6 pts.) Provide an estimate for each real number. If the number is not real, say so.

a) $\sqrt{37}$  

b) $-\sqrt{3}$  

c) $\sqrt{-3}$

23. (7 pts.) Simplify completely: $7\sqrt{20} - 2\sqrt{45}$

24. (7 pts.) Solve: $\sqrt{4 - x} - x = 2$

25. (7 pts.) A right triangle has two equal sides, each $3\sqrt{2}$ inches long. Find the length of the hypotenuse.

26. (7 pts.) Simplify and write the answer in the form $a + bi$:

\[
(\sqrt{3} - 2\sqrt{3}i)^2 - (3 - 5i)
\]

27. (7 pts.) Solve, writing any non-real solutions in the form $a + bi$:

\[x(x^2 - 2x) = -3x\]

28. (7 pts.) Graph, labeling the vertex and all $x$ and $y$ intercepts:

\[g(x) = 2x^2 - 8x + 8\]

29. (7 pts.) Solve:

\[x^2 + 3x \leq 10\]

30. (6 pts.) Find:

a) $\log_{17}(1)$  

b) $\log_2(16)$  

c) $\log_{81}(9)$