Name:
Recitation Instructor:  Recitation Day & Time:

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**MATH 100  College Algebra – Final Exam**  
7:00–9:00pm, Wednesday May 15, 2002  
**SHOW ALL YOUR WORK**

1. (10 points) Solve and graph the inequality $|2x - 1| \leq 3$. 
Remember to indicate whether end-points are included or excluded.

```
-5  -4  -3  -2  -1  0   1   2   3   4   5   x
```

2. (10 points) Simplify $\sqrt{x^2y^6} \over (x^2y)^3$ using only positive rational exponents (assume $x, y$ positive).

3. (10 points)
   (a) Find the slope of the line through the points $(1, -3)$ and $(-3, 5)$.

   (b) Give the slope-intercept form of the equation of the straight line through the points in (a).

4. (10 points) Solve the equation $\frac{x}{x - 1} = \frac{2}{x + 5}$. 
5. (10 points)
(a) Write $3 \ln x + \frac{1}{2} \ln y - 2 \ln z$ as a single logarithm (here $x, y, z$ are positive real numbers).

(b) Evaluate $\log_3 5$ to three decimal places.

6. (10 points) Solve the inequality $\frac{x(x - 3)}{x + 2} \geq 0$. Graph your solution.

7. (10 points) Solve $\log_5 (3x + 4) = 2$.

8. (10 points) $\$1000$ is deposited in an account offering an annual interest rate of 3% compounded monthly. How much is in the account after 5 years?
9. (10 points) For the following functions find the vertical, horizontal and slant asymptotes (give the **equation** of the asymptote or write N/A if none of that type exists).

<table>
<thead>
<tr>
<th>function</th>
<th>vertical</th>
<th>horizontal</th>
<th>slant</th>
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</thead>
<tbody>
<tr>
<td>(f(x) = \frac{2x}{x - 5})</td>
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<tr>
<td>(f(x) = \frac{x^2 + x}{x - 4})</td>
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10. (10 points) Solve the equation \(\sqrt{3x + 1} + 2 = 0\).

11. (10 points) \(f(x) = x^3 + 3x^3 + 5x + 15\).
   (a) Use the rational-zero test to list the possible rational zeros of \(f(x)\).

   (b) Determine the rational zeros (use your calculator to reduce the possibilities).

   (c) Find the remaining zeros.

12. (10 points) Given the graph of \(y = f(x)\), sketch the indicated graphs.

\[
\begin{align*}
y = f(x) & \\
3 & \quad 2 \\
1 & \\
-1 & \quad -2 \quad -3 \\
\end{align*}
\]

\[
\begin{align*}
y = f(x) + 1 & \\
3 & \quad 2 \\
1 & \quad -1 \\
-1 & \quad -2 \\
-3 & \\
\end{align*}
\]

\[
\begin{align*}
y = f(-x) & \\
3 & \quad 2 \\
1 & \quad -1 \\
-1 & \quad -2 \\
-3 & \\
\end{align*}
\]
13. (10 points)
(a) Factor: \( x^2 - 3x - 10 = \)

(b) Give the partial-fraction decomposition of \( \frac{x + 9}{x^2 - 3x - 10} \).

14. (10 points) (a) Give the augmented matrix for the system of equations:

\[
\begin{align*}
3x - 2y + 5z &= 13 \\
2x + y - 3z &= 4 \\
5x - y - z &= 17.
\end{align*}
\]

(b) Use your calculator to find the reduced row-echelon form of this matrix.

(c) Use (b) to solve, if possible, the system of equations in (a):

15. (10 points) Solve

\[5e^{2x} = 3.\]

Give an exact answer involving logarithms (a calculator decimal will earn only partial credit).

16. (10 points) \( y = 3x^2 + 6x - 2. \)
(a) Give the coordinates of the vertex:

(b) Give the coordinates of the \( y \)-intercept:

(c) Give the coordinates of the \( x \)-intercepts:
17. (10 points)
(a) If \( f(x) = \frac{1}{x} \) and \( g(x) = x + 5 \), then the composition \((f \circ g)(x) = \) ____________.

(b) If \( h(x) = 2x - 3 \), then the inverse function \( h^{-1}(x) = \) ____________.

18. (10 points) Perform the indicated division and write the improper fraction as a polynomial plus a proper fraction:
\[
\frac{5x^3 - 2x^2 + 3x - 2}{x^2 - x - 1} =
\]

19. (10 points) Simplify: \( \frac{2}{x+3} - \frac{1}{x+1} \).

20. (10 points) Use elimination or substitution to solve the system of equations:
\[
\begin{align*}
x - y &= 5 \\
x^2 - 3x + y &= 3.
\end{align*}
\]