Instructions: Solve each problem on the paper provided, showing work *with* answers. Do this neatly, with the problem number clearly visible. Do not cram answers onto the exam paper itself. Failure to follow these instructions may incur a substantial loss of points.

1. 10 pts. each Write in lowest terms.

   (a) $\dfrac{v^2 - 36}{5v + 30}$

   (b) $\dfrac{8x^2 - 10x - 3}{8x^2 - 6x - 9}$

2. 10 pts. each Multiply or divide as indicated, and write in lowest terms.

   (a) $\dfrac{u^3 v^2}{15u^2 v^4} \div \dfrac{12u^4 v^2}{5v^{11}}$

   (b) $\dfrac{z^2 - 1}{6z} \cdot \dfrac{2}{1 - z}$

3. 10 pts. each Add or subtract as indicated, and write in lowest terms.

   (a) $\dfrac{1}{x - 5} - \dfrac{1}{x - 3}$

   (b) $\dfrac{5x}{x - 3} + \dfrac{2}{x} + \dfrac{6}{x^2 - 3x}$

4. 10 pts. Simplify the complex fraction:

$$\dfrac{4 - \dfrac{1}{2q}}{9 + \dfrac{5}{q}}$$

5. 10 pts. each Solve each equation.

   (a) $2 - \dfrac{5}{2x} = \dfrac{2x}{x + 1}$

   (b) $\dfrac{2x}{x - 3} + \dfrac{4}{x + 3} = \dfrac{-24}{x^2 - 9}$

6. 10 pts. Solve $I = \dfrac{nE}{R + nr}$ for r.

7. 15 pts. Lord Umberbottom lives in a flat in London. Some days he rides his pennyfarthing to the pub at Piccadilly Circus, while other days he strolls. When he rides his penny-farthing, he gets to the pub 36 minutes faster than when he strolls. If his average walking speed is 3 mph and his average riding speed is 12 mph, how far is it from his flat to the pub?

8. 10 pts. If a vat of acid can be filled by an inlet pipe in 9 hours and emptied by an outlet pipe in 11 hours, how long will it take to fill the vat if both pipes are open?

9. 10 pts. each Solve each system of equations. If the system is inconsistent or has dependent solutions, say so.

   (a)
   $$\begin{cases} 2x - 5y = 3 \\ y - 2x = 9 \end{cases}$$

   (b)
   $$\begin{cases} 2x + 4y = 12 \\ -x - 2y = -6 \end{cases}$$

10. 10 pts. Evaluate $32^{-3/5}$ (show work, since you're supposed to be doing this by hand).

11. 10 pts. each Simplify each expression. Write all answers with positive exponents. Assume all variables represent positive real numbers.

   (a) $s^{-8/7} \cdot s^{13/7}$

   (b) $\dfrac{m^{3/4} n^{-1/4}}{(m^2 n)^{1/2}}$