1. List all numbers for which each expression is undefined (bad points). (5 pts each)

A. \( \frac{4x^2}{3x+7} \)

\[ 3x + 7 = 0 \]
\[ 3x = -7 \]
\[ x = \frac{-7}{3} \]

B. \( \frac{5m+2}{m^2-25} \)

\[ m^2 - 25 = 0 \]
\[ (m-5)(m+5) = 0 \]
\[ m = \pm 5 \]

2. Simplify (6 pts each)

A. \( \frac{x^2 - 6x + 5}{x^2 - 2x - 15} \)

\[ \frac{(x-5)(x-1)}{(x-5)(x+3)} \]
\[ \frac{(x-1)}{(x+3)} \]

B. \( \frac{z^2 + 6z - 27}{z^2 + 4z - 21} \)

\[ \frac{(x+9)(x-3)}{(x+7)(x-3)} \]
\[ \frac{x+9}{x+7} \]

C. \( \frac{2t-14}{7-t} \)

\[ \frac{2(7-t)}{-1(7-t)} \]
\[ -2 \]

D. \( \frac{64-a}{a^2 - 64a} \)

\[ -1 \frac{(4-a)}{a(4-64)} \]
\[ -\frac{1}{a} \]
3. Perform the indicated operation. Make sure to simplify your answer to reduced form.

A. (6 pts) Multiply. \[
\frac{6x - 18}{4x^2 + 12x} \cdot \frac{3x + 9}{5x - 15}
\]
\[
\frac{2(3x-3)}{x(x+3)} \cdot \frac{3(x+3)}{5(x-3)} = \frac{9}{10x}
\]

B. (6 pts) Multiply. \[
\frac{d^2 + 2d - 15}{2d^2 + 7d + 5} \cdot \frac{2d^2 + 13d + 20}{d^2 + d - 12}
\]
\[
\frac{(d+3)(d-5)}{(d+1)(d+5)} \cdot \frac{(2d+5)(d+4)}{(d+4)(d-3)} = \frac{20+5}{20+1}
\]

C. (6 pts) Divide. \[
\frac{y^2 + 3y - 18}{y^2 - 6y + 8} + \frac{y + 6}{y - 4}
\]
\[
\frac{y^2 + 3y - 18}{y^2 - 6y + 8} \cdot \frac{y - 4}{y - 4}
\]
\[
\frac{(y+3)(y+6)}{(y-2)(y+4)} \cdot \frac{(y+4)}{(y+6)} = \frac{y-3}{y-2}
\]
4. Perform the indicated operation. Make sure to simplify your answers to reduced form.

A. (6 pts) Subtract. \( \frac{5m}{m+1} \frac{1+4m}{m+1} = \frac{5m-(1+4m)}{m+1} = \frac{5m-4m-1}{m+1} = \frac{m-1}{m+1} \)

B. (6 pts) Subtract. \( \frac{5}{k-5} \frac{9}{k} \)

\[
\left( \frac{5}{k-5} \right) \left( \frac{k}{k} \right) - \frac{9}{k} \left( \frac{k-5}{k-5} \right) = \frac{5k - 9k + 45}{k(k-5)} = \frac{-4k + 45}{k(k-5)}
\]

C. (6 pts) Add. \( \frac{r}{r-2} + \frac{-8}{(r+2)(r-2)} \)

\[
\frac{\sqrt{r}}{r-2} \left( \frac{r+2}{r+2} \right) - \frac{8}{(r+2)(r-2)} = \frac{\sqrt{r}^2 + 2r - 8}{(r+2)(r-2)} = \frac{(r+4)(r-2)}{(r+2)(r-2)} = \frac{r+4}{r+2}
\]

5. (6 pts) Simplify the complex fraction: \( \frac{1}{x^2-36} \frac{3}{x+6} \)

\[
\frac{1}{(x-6)(x+6)} \cdot \frac{3}{x+6} = \frac{1}{3(x-6)}
\]
6. Solve the following equations. Be sure to check your solutions.

A. (8 pts) Solve for s: \( \frac{-6}{B^2-9} = \frac{-2B}{B-3} + \frac{1}{B+3} \)

\[ \frac{(B-3)(B+3)}{(B-3)(B+3)} \]

\[ -6 = 2B(B+3) + B-3 \]

\[ -6 = 2B^2 + 6B + B-3 \]

\[ +6 \]

\[ 0 = 2B^2 + 7B + 3 \]

\[ 0 = (2B+1)(B+3) \]

\[ 2B+1 = 0 \]

\[ B = -\frac{1}{2} \]

\[ B = -\frac{1}{2} \]

B. (8 pts) Solve for x: \( \frac{7}{y^2-3y+2} = \frac{3}{y-2} + \frac{1}{y-1} \)

\[ \frac{7}{(y-2)(y-1)} \]

\[ 7 = 3(y-1) + y-2 \]

\[ 7 = 3y-3 + y-2 \]

\[ 7 = 4y-5 \]

\[ +5 \]

\[ 12 = 4y \]

\[ y = 3 \]
7: (8 pts) Working alone, Charles can paint a room in 6 hr. Doris takes 8 hours working alone to paint the same room. How long will it take them if they work together?

\[ \frac{1}{6} + \frac{1}{8} = 1 \]

\[ 4T + 3T = 24 \]

\[ \frac{7T}{7} = \frac{24}{7} \]

\[ \frac{1}{T} = \frac{24}{7} \text{ Hours} = 3 \frac{3}{7} \text{ Hours} \]

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**BONUS (total of 10 extra points)**

\[ \frac{x-8}{x-4} + \left( \frac{x^2-12x+32}{x^2-8x} \right) \cdot \frac{x^2-8x+16}{x^2-8x+16} \]

\[ \frac{x-8}{x-4} \cdot \left( \frac{8x}{x^2-12x+32} \right) \cdot \frac{x^2-8x+16}{x^2-8x} \]

\[ \frac{x-8}{x-4} \cdot \frac{8x}{x} \cdot \frac{(x-4)(x-4)}{x(x-8)} \]

\[ \frac{8}{x-8} \]

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**Page 5**