Name _____ Date _____

Practice 4.1: Rational Functions

1. Find the Domain of the following functions.

a. $f(x) = x^2 + 7x - 11$

any real number

b. $g(x) = \frac{3x}{x-8}$

$x \neq 8$

c. $h(x) = \sqrt{x+4}$

$x \geq -4$

d. $j(x) = \frac{\sqrt{x-2}}{x^2 - 3x - 28}$

2. Simplify.

a. $\frac{12}{15}$ $\quad \frac{\cancel{3}\cdot 4}{\cancel{3}\cdot 5} = \frac{3}{3}\cdot\frac{4}{5} = 1\cdot\frac{4}{5} = \frac{4}{5}$

b. $\frac{6+12}{6}$ $\quad = \frac{18}{6} = 3$

c. $\frac{24x^2}{15x}$ $\quad \frac{24}{15}\ \frac{\cancel{x}\cdot x}{\cancel{x}}$ $\quad \frac{8}{5}x$

d. $\frac{4x^5}{30x^2}$ $\quad \frac{2\ \cancel{x\cdot x}\cdot x\cdot x\cdot x}{15\ \cancel{x\cdot x}}$ $\quad \frac{2x^3}{15}$

e. $\frac{6xy}{xy - x}$

1) factor.
2) cancel

$\frac{6\cancel{xy}}{\cancel{x}(y-1)} = \frac{6y}{y-1}$

f. $\frac{2x-2}{5x^2-5x} = \frac{2\cancel{(x-1)}}{5x\cancel{(x-1)}} = \frac{2}{5x}$

g. $\frac{x^2-4}{x+2} = \frac{\cancel{(x+2)}(x-2)}{\cancel{(x+2)}} = x-2$

h. $\frac{x^2-9}{3-x}$ $\quad -x+3$ $\quad \frac{(x+3)\cancel{(x-3)}}{-1\cancel{(x-3)}} = \frac{x+3}{-1}$

$-1(x+3)$

i. $\frac{x^2-4x-21}{x^2-10x+21}$ $\quad \frac{\cancel{(x-7)}(x+3)}{\cancel{(x-7)}(x-3)} = \frac{x+3}{x-3}$

j. $\frac{x^2+8x+16}{x^2-16}$

k. $\frac{x^2-100}{x^2+15x+50}$

l. $\frac{x^2+x-30}{x^2-7x-30}$ $\quad \frac{(x+6)(x-5)}{(x+3)(x-10)}$

m. $\frac{x^2-2x-35}{x^3+5x^2+3x+15}$

n. $\frac{x^3+6x^2-4x-24}{x^2+8x+12}$

$\frac{x^2(x+6)-4(x+6)}{(x+6)(x+2)}$

$\frac{(x^2-4)\cancel{(x+6)}}{\cancel{(x+6)}(x+2)} = \frac{\cancel{(x+2)}(x-2)}{\cancel{(x+2)}}$

$= x-2$

3. Perform the operation and simplify.

a. $\frac{\cancel{x}}{\cancel{x+1}} \bullet \frac{\cancel{x+1}}{3\cancel{x}(x+2)} = \frac{1}{3(x+2)}$

b. $\frac{x^2}{x+1} \bullet \frac{x^2-1}{x}$

c. $\frac{5x^2-15x}{25x+25} \bullet \frac{15}{x-3}$

d. $\frac{x^2-15x+56}{x^2-49} \bullet \frac{x^2+14x+49}{x^2-x-56}$

e. $\frac{x^2-11x+18}{x^2+3x-10} \bullet \frac{x^2+14x+45}{x^3-81x}$

f. $\frac{x^2-4x}{x+3} \bullet \frac{x^2+6x+9}{x^2-2x-8} \bullet \frac{x^2-x-6}{x^3+3x^2}$

g. $\frac{x+2}{5x-15} \div \frac{x-2}{5(x-3)}$

h. $\frac{x^2-16}{x-6} \div \frac{x-4}{x^2-2x-24}$

i. $\frac{x^3-x}{x-1} \div \frac{(x+1)^2}{x^2-2x+1}$

j. $\frac{x^2-6x}{x^2-36} \bullet \frac{x^2-8x+12}{x^2-4x-12} \div \frac{x^2+4x-12}{x^2+8x+12}$

$\frac{x\cancel{(x-6)}}{(x+6)\cancel{(x-6)}} \cdot \frac{\cancel{(x-6)}\cancel{(x-2)}}{\cancel{(x+6)}\cancel{(x+2)}} \bullet \frac{\cancel{(x+6)}\cancel{(x+2)}}{\cancel{(x+6)}\cancel{(x-2)}}$

$\frac{x}{x+6}$

k. $\frac{\frac{x^2}{\cancel{(x+1)^2}}}{\frac{x}{\cancel{(x+1)^3}}} \bullet \frac{(x+1)^{\cancel{3}\,1}}{\cancel{(x+1)^{\cancel{2}\,1}}} = \frac{\cancel{x^2}(x+1)}{\cancel{x}} = x(x+1)$

$\frac{x^2}{(x+1)^2} \div \frac{x}{(x+1)^3}$

$\frac{x}{\cancel{(x+1)^3}} \bullet \frac{\cancel{(x+1)^3}}{1}$

$\frac{x^2}{\cancel{(x+1)^2}} \cdot \frac{(x+1)^{\cancel{3}}}{1}$

l. $\frac{\frac{x^2-9}{\cancel{x^2}}}{\frac{(x-3)^2}{\cancel{3x}}} \cdot \frac{3\cancel{x^2}}{\cancel{3x^2}} = \frac{3(x^2-9)}{x^2(x-3)^2}$ $(x+3)\cancel{(x-3)}$ $(x-3)\cancel{(x-3)}$

Top: $\frac{x^2-9}{\cancel{x^2}} \cdot \frac{3\cancel{x^2}}{1} = 3(x^2-9)$

bottom: $\frac{(x-3)^2}{\cancel{3x}} \cdot \frac{\cancel{3x^2}}{1} = x^2(x-3)^2$

$= \frac{3(x+3)}{x^2(x-3)}$