6.3 Pre-Calculus Math 11

page 336 #1, 5-7, 10 (do at least 3 of each)

1. a) $\frac{11x}{6} - \frac{4x}{6}$

$\frac{7x}{6}$

all values allowed because there is no variable in the denominator

b) $\frac{7}{x} + \frac{3}{x}$ $x \neq 0$

$\frac{10}{x}$

c) $\frac{5t+3}{10} + \frac{3t+5}{10}$

$\frac{8t+8}{10}$

$\frac{4\cancel{8}(t+1)}{\cancel{10}5}$

$\frac{4(t+1)}{5}$

d) $\frac{m^2}{m+1} + \frac{m}{m+1}$ $m+1 \neq 0$, $m \neq -1$

$\frac{m^2+m}{m+1}$

$\frac{m\cancel{(m+1)}}{\cancel{m+1}}$

m

e) $\frac{a^2}{a-4} - \frac{a}{a-4} - \frac{12}{a-4}$ $a-4 \neq 0$, $a \neq 4$

$\frac{a^2-a-12}{a-4}$

$\frac{\cancel{(a-4)}(a+3)}{\cancel{a-4}}$

$a+3$

5. a) $\frac{1}{3a} + \frac{2}{5a}$

$\frac{5}{15a} + \frac{6}{15a}$

$\frac{11}{15a}$

$15a \neq 0$

$a \neq 0$

b) $\frac{3}{2x} + \frac{1}{6}$

$\frac{9}{6x} + \frac{x}{6x}$

$\frac{9+x}{6x}$

$2x \neq 0$

$x \neq 0$

lowest common denom:

$2x$ 6

$2 \cdot x$ $2 \cdot 3$

$2 \cdot x \cdot 3 = 6x$

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5. c) $4 - \frac{6}{5x}$ $\quad 5x \neq 0$, $x \neq 0$

$\frac{20x}{5x} - \frac{6}{5x}$

$\frac{20x-6}{5x}$

$\frac{2(10x-3)}{5x}$

factor to check if it can be reduced

d) $\frac{4z}{xy} - \frac{9x}{yz}$ $\quad$ low. com. denom. $x \cdot y \cdot z$, $x \neq 0, y \neq 0, z \neq 0$

$\frac{4z^2}{xyz} - \frac{9x^2}{xyz}$

$\frac{4z^2 - 9x^2}{xyz}$

$\frac{(2z-3x)(2z+3x)}{xyz}$

e) $\frac{2s}{5t^2} + \frac{1}{10t} - \frac{6}{15t^3}$

low. com. denom.

$5t^2 \quad 10t \quad 15t^3$

$5 \cdot t \cdot t \quad 2 \cdot 5 \cdot t \quad 3 \cdot 5 \cdot t \cdot t \cdot t$

$5 \cdot t \cdot t \cdot 2 \cdot 3 \cdot t = 30t^3$

$\frac{12st}{30t^3} + \frac{3t^2}{30t^3} - \frac{12}{30t^3}$

$\frac{12st + 3t^2 - 12}{30t^3}$

$\frac{\cancel{3}(4st + t^2 - 4)}{10\cancel{30}t^3}$

$\frac{4st + t^2 - 4}{10t^3}$

$t \neq 0$

f) $\frac{6xy}{a^2b} - \frac{2x}{ab^2y} + 1$

low. com. den.

$a \cdot a \cdot b \quad a \cdot b \cdot b \cdot y$

$a \cdot a \cdot b \cdot b \cdot y = a^2b^2y$

$\frac{6bxy^2}{a^2b^2y} - \frac{2ax}{a^2b^2y} + \frac{a^2b^2y}{a^2b^2y}$

$\frac{6bxy^2 - 2ax + a^2b^2y}{a^2b^2y}$

$a \neq 0, b \neq 0, y \neq 0$

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6. a) $\frac{8}{x^2-4} - \frac{5}{x+2}$

$\frac{8}{(x+2)(x-2)} - \frac{5}{x+2}$

$\frac{8}{(x+2)(x-2)} - \frac{5(x-2)}{(x+2)(x-2)}$

$\frac{8-5(x-2)}{(x+2)(x-2)}$

$\frac{8-5x+10}{(x+2)(x-2)}$

$\frac{18-5x}{(x+2)(x-2)}$

$x+2 \neq 0, \quad x-2 \neq 0$

$x \neq -2 \quad x \neq 2$

b) $\frac{1}{x^2-x-12} + \frac{3}{x+3}$

$\frac{1}{(x-4)(x+3)} + \frac{3}{x+3}$

$\frac{1}{(x-4)(x+3)} + \frac{3(x-4)}{(x-4)(x+3)}$

$\frac{1+3(x-4)}{(x-4)(x+3)}$

$\frac{1+3x-12}{(x-4)(x+3)}$

$\frac{3x-11}{(x-4)(x+3)}$

$x-4 \neq 0, \quad x+3 \neq 0$

$x \neq 4 \quad x \neq -3$

c) $\frac{3x}{x+2} - \frac{x}{x-2}$

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

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

$\frac{3x^2-6x-x^2-2x}{(x+2)(x-2)}$

$\frac{2x^2-8x}{(x+2)(x-2)}$

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

$x+2 \neq 0, \quad x-2 \neq 0$

$x \neq -2 \quad x \neq 2$

d) $\frac{5}{y+1} - \frac{1}{y} - \frac{y-4}{y^2+y}$

$\frac{5}{y+1} - \frac{1}{y} - \frac{y-4}{y(y+1)}$

$\frac{5y}{y(y+1)} - \frac{1(y+1)}{y(y+1)} - \frac{y-4}{y(y+1)}$

$\frac{5y-1(y+1)-(y-4)}{y(y+1)}$

brackets very important after a minus!

$\frac{5y-y-1-y+4}{y(y+1)}$

$\frac{3y+3}{y(y+1)}$

$\frac{3\cancel{(y+1)}}{y\cancel{(y+1)}}$

$\frac{3}{y}$

$y \neq 0, \quad y+1 \neq 0$

$y \neq -1$

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6. e) $\frac{2h}{h^2-9} + \frac{h}{h^2+6h+9} - \frac{3}{h-3}$

$\frac{2h}{(h-3)(h+3)} + \frac{h}{(h+3)(h+3)} - \frac{3}{h-3}$

$\frac{2h(h+3)}{(h-3)(h+3)(h+3)} + \frac{h(h-3)}{(h-3)(h+3)(h+3)} - \frac{3(h+3)(h+3)}{(h-3)(h+3)(h+3)}$

$\frac{2h^2+6h+h^2-3h-3(h^2+6h+9)}{(h-3)(h+3)(h+3)}$

$\frac{\cancel{2h^2}+6h+\cancel{h^2}-3h-\cancel{3h^2}-18h-27}{(h-3)(h+3)(h+3)}$

$\frac{-15h-27}{(h-3)(h+3)(h+3)}$

$h-3 \neq 0$, $h+3 \neq 0$

$h \neq 3$, $h \neq -3$

f) $\frac{2}{x^2+x-6} + \frac{3}{x^3+2x^2-3x}$

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

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

low. com. denom
$(x+3)\cdot(x-2)\cdot x\cdot(x-1)$

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

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

$\frac{2x^2-2x+3x-6}{x(x+3)(x-2)(x-1)}$

$\frac{2x^2+x-6}{x(x+3)(x-2)(x-1)}$

factor $2x^2+x-6$ mult $= -12$
add $= 1$

$2x^2+4x-3x-6$

$2x(x+2)-3(x+2)$

$(x+2)(2x-3)$

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

$x \neq 0$, $x+3 \neq 0$, $x-2 \neq 0$, $x-1 \neq 0$

$x \neq -3$, $x \neq 2$, $x \neq 1$

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7. a) $\dfrac{3x+15}{x^2-25} + \dfrac{4x^2-1}{2x^2+9x-5}$

factor $2x^2+9x-5$ $\quad -10$, 9

$2x^2+10x-x-5$

$2x(x+5)-1(x+5)$

$(x+5)(2x-1)$

$\dfrac{3\cancel{(x+5)}}{\cancel{(x+5)}(x-5)} + \dfrac{\cancel{(2x-1)}(2x+1)}{(x+5)\cancel{(2x-1)}}$

$\dfrac{3}{x-5} + \dfrac{2x+1}{x+5}$

$\dfrac{3(x+5)}{(x-5)(x+5)} + \dfrac{(2x+1)(x-5)}{(x-5)(x+5)}$

$\dfrac{3x+15+2x^2-10x+x-5}{(x-5)(x+5)}$

$\dfrac{2x^2-6x+10}{(x-5)(x+5)}$

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

$x-5\neq 0$, $x+5\neq 0$, $2x-1\neq 0$

$x\neq 5$ $\quad x\neq -5$ $\quad 2x\neq 1$

$x\neq \frac{1}{2}$

b) $\dfrac{2x}{x^3+x^2-6x} - \dfrac{x-8}{x^2-5x-24}$

$\dfrac{2\cancel{x}}{\cancel{x}(x^2+x-6)} - \dfrac{\cancel{x-8}}{\cancel{(x-8)}(x+3)}$

$\dfrac{2}{(x+3)(x-2)} - \dfrac{1}{x+3}$

$\dfrac{2}{(x+3)(x-2)} - \dfrac{x-2}{(x+3)(x-2)}$

$\dfrac{2-(x-2)}{(x+3)(x-2)}$

$\dfrac{2-x+2}{(x+3)(x-2)}$

$\dfrac{4-x}{(x+3)(x-2)}$

$x-8\neq 0$, $x+3\neq 0$, $x-2\neq 0$

$x\neq 8$ $\quad x\neq -3$ $\quad x\neq 2$

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7. c) $\dfrac{n+3}{n^2-5n+6} + \dfrac{6}{n^2-7n+12}$

$$\frac{n+3}{(n-2)(n-3)} + \frac{6}{(n-3)(n-4)}$$

$$\frac{(n+3)(n-4)}{(n-2)(n-3)(n-4)} + \frac{6(n-2)}{(n-2)(n-3)(n-4)}$$

$$\frac{(n+3)(n-4)+6(n-2)}{(n-2)(n-3)(n-4)}$$

$$\frac{n^2-4n+3n-12+6n-12}{(n-2)(n-3)(n-4)}$$

$n-2\neq 0$, $n-3\neq 0$, $n-4\neq 0$

$n\neq 2$ $\quad n\neq 3$ $\quad n\neq 4$

$$\frac{n^2+5n-24}{(n-2)(n-3)(n-4)}$$

$$\frac{(n+8)\cancel{(n-3)}}{(n-2)\cancel{(n-3)}(n-4)}$$

$$\frac{n+8}{(n-2)(n-4)}$$

d) $\dfrac{2w}{w^2+5w+6} - \dfrac{w-6}{w^2+6w+8}$

$$\frac{2w}{(w+2)(w+3)} - \frac{w-6}{(w+2)(w+4)}$$

$$\frac{2w(w+4)}{(w+2)(w+3)(w+4)} - \frac{(w-6)(w+3)}{(w+2)(w+3)(w+4)}$$

$$\frac{2w(w+4)-(w-6)(w+3)}{(w+2)(w+3)(w+4)}$$

$$\frac{2w^2+8w-(w^2+3w-6w-18)}{(w+2)(w+3)(w+4)}$$

$$\frac{2w^2+8w-w^2-3w+6w+18}{(w+2)(w+3)(w+4)}$$

$$\frac{w^2+11w+18}{(w+2)(w+3)(w+4)}$$

$w+2\neq 0$, $w+3\neq 0$, $w+4\neq 0$

$w\neq -2$ $\quad w\neq -3$ $\quad w\neq -4$

$$\frac{(w+8)\cancel{(w+3)}}{(w+2)\cancel{(w+3)}(w+4)}$$

$$\frac{w+8}{(w+2)(w+4)}$$

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10. a) $\dfrac{2-\frac{6}{x}}{1-\frac{9}{x^2}} \cdot \dfrac{x^2}{x^2}$

$\dfrac{2x^2-\frac{6x^{\cancel{2}}}{\cancel{x}}}{x^2-\frac{9\cancel{x^2}}{\cancel{x^2}}}$

$\dfrac{2x^2-6x}{x^2-9}$

$\dfrac{2x\cancel{(x-3)}}{(x+3)\cancel{(x-3)}}$

$\dfrac{2x}{x+3}$

$x \neq 0$, $x+3 \neq 0$, $x-3 \neq 0$

$x \neq -3$ $\quad x \neq 3$

b) $\dfrac{\frac{3}{2}+\frac{3}{t}}{\frac{t}{t+6}-\frac{1}{t}} \cdot \dfrac{2t(t+6)}{2t(t+6)}$

$\dfrac{\cancel{2t}(t+6)\cdot\frac{3}{\cancel{2}} + \cancel{2t}(t+6)\cdot\frac{3}{\cancel{t}}}{2t\cancel{(t+6)}\cdot\frac{t}{\cancel{t+6}} - \cancel{2t}(t+6)\cdot\frac{1}{\cancel{t}}}$

$\dfrac{3t(t+6)+6(t+6)}{2t^2-2(t+6)}$

$\dfrac{3t^2+18t+6t+36}{2t^2-2t-12}$

$\dfrac{3t^2+24t+36}{2t^2-2t-12}$

$\dfrac{3(t^2+8t+12)}{2(t^2-t-6)}$

$\dfrac{3(t+6)\cancel{(t+2)}}{2(t-3)\cancel{(t+2)}}$

$t \neq 0$, $t+6 \neq 0$, $t-3 \neq 0$, $t+2 \neq 0$

$t \neq -6$ $\quad t \neq 3$ $\quad t \neq -2$

$\dfrac{3(t+6)}{2(t-3)}$

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10. c) $$\frac{\frac{3}{m} - \frac{3}{2m+3}}{\frac{3}{m^2} + \frac{1}{2m+3}} \cdot \frac{m^2(2m+3)}{m^2(2m+3)}$$

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

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

$$\frac{6m^2+9m-3m^2}{6m+9+m^2}$$

$$\frac{3m^2+9m}{m^2+6m+9}$$

$$\frac{3m\cancel{(m+3)}}{(m+3)\cancel{(m+3)}}$$

$$\frac{3m}{m+3}$$

$m \neq 0$, $2m+3 \neq 0$, $m+3 \neq 0$

$2m \neq -3$ $\quad$ $m \neq -3$

$m \neq \frac{-3}{2}$

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10. d)

$$\frac{\frac{1}{x+4} + \frac{1}{x-4}}{\frac{x}{x^2-16} + \frac{1}{x+4}}$$

$$\frac{\frac{1}{x+4} + \frac{1}{x-4}}{\frac{x}{(x+4)(x-4)} + \frac{1}{x+4}} \cdot \frac{(x-4)(x+4)}{(x-4)(x+4)}$$

$$\frac{(x-4)\cancel{(x+4)} \cdot \frac{1}{\cancel{x+4}} + \cancel{(x-4)}(x+4) \cdot \frac{1}{\cancel{x-4}}}{\cancel{(x-4)}\cancel{(x+4)} \cdot \frac{x}{\cancel{(x+4)}\cancel{(x-4)}} + (x-4)\cancel{(x+4)} \cdot \frac{1}{\cancel{x+4}}}$$

$$\frac{x-4+x+4}{x+x-4}$$

$$\frac{2x}{2x-4}$$

$x+4 \neq 0$, $x-4 \neq 0$, $x-2 \neq 0$

$x \neq -4$ $\quad x \neq 4$ $\quad x \neq 2$

$$\frac{\cancel{2}x}{\cancel{2}(x-2)}$$

$$\frac{x}{x-2}$$