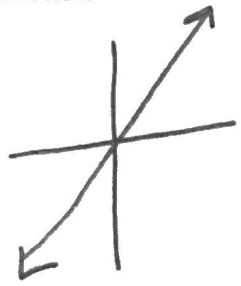
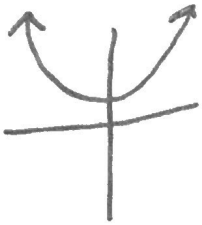
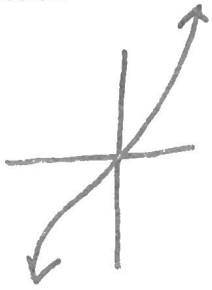
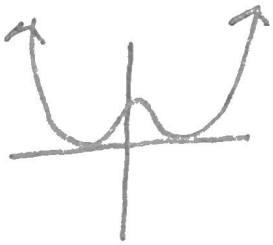
Name: Key Hour: _____ **Algebra 2 Semester 2 Review**

Part 1: Polynomials

1. Sketch a linear function	2. Sketch a quadratic function	3. Sketch a cubic function	4. Sketch a quartic function
			

5. Identify the end behavior for the following functions.

a) $4x^3 + 2x^2 - 1$ (+ O ↓↑)

R as $x \to +\infty, f(x) \to$ +∞

L as $x \to -\infty, f(x) \to$ -∞

b) $-5x^2 + 6x - 7$ (− E ↓↓)

R as $x \to +\infty, f(x) \to$ -∞

L as $x \to -\infty, f(x) \to$ -∞

c) $3x^4 - 7x + 8$ (+ E ↑↑)

R as $x \to +\infty, f(x) \to$ +∞

L as $x \to -\infty, f(x) \to$ +∞

d) $-2x^5 + 5x^3 - x7$ (− O ↑↓)

R as $x \to +\infty, f(x) \to$ -∞

L as $x \to -\infty, f(x) \to$ +∞

Simplify the following expressions:

6. $(2x^4 - 7x^3 + 4x - 7) + (2x^2 - 4x + 8)$

$2x^4 - 7x^3 + 2x^2 + 1$

7. $(-4x^3 + 7x - 6) - (7x^4 + 3x^3 - 2x - 4)$

$-4x^3 + 7x - 6 - 7x^4 - 3x^3 + 2x + 4$

$-7x^4 - 7x^3 + 9x - 2$

8. $(3x^3 + 2x + 7)(x^2 - 4)$

$3x^5 - 12x^3 + 2x^3 - 8x + 7x^2 - 28$

$3x^5 - 10x^3 + 7x^2 - 8x - 28$

9. $(x + 2)(2x^2 + 5x + 3)$

$2x^3 + 5x^2 + 3x + 4x^2 + 10x + 6$

$2x^3 + 9x^2 + 13x + 6$

10. $8x^4 - 3x^2(2x^3 - 5x)$

$8x^4 - 6x^5 + 15x^3$

$-6x^5 + 8x^4 + 15x^3$

11. $2x^2 - 5x^3(3x^4 + 4x)$

$2x^2 - 15x^7 - 20x^4$

$-15x^7 - 20x^4 + 2x^2$

Find the quotient and explain whether the divisor is a factor of the dividend.

12. $(x^4 - 4x^3 - 3x^2 + 14x - 8) \div (x - 3)$

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

$x-3 \overline{)\, x^4 - 4x^3 - 3x^2 + 14x - 8}$

$-(x^4 - 3x^3)$

$-x^3 - 3x^2$

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

$-6x^2 + 14x$

$-(-6x^2 + 18x)$

$-4x - 8$

$-(-4x + 12)$

-20

$x^3 - x^2 - 6x - 4 - \frac{20}{x-3}$

The divisor is not a factor. There is a remainder

13. $(x^3 - 4x^2 + 3x + 2) \div (x + 2)$

Same

$x^2 - 6x + 15$

$x+2 \overline{)\, x^3 - 4x^2 + 3x + 2}$

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

$-6x^2 + 3x$

$-(-6x^2 - 12x)$

$15x + 2$

$-(15x + 30)$

-28

$x^2 - 6x + 15 - \frac{28}{x+2}$

Completely factor AND solve the following polynomials.

14. $x^2 + 6x + 8 = 0$

$(x+4)(x+2) = 0$

$x + 4 = 0$ $\quad$ $x + 2 = 0$

$x = -4$ $\quad$ $x = -2$

15. $6x^2 + x - 2 = 0$

-12, 2; $3x$, $-2x$; $2x$, 1

$(3x+2)(2x-1) = 0$

$3x + 2 = 0$ $\quad$ $2x - 1 = 0$

$x = -\frac{2}{3}$ $\quad$ $x = \frac{1}{2}$

16. $x^4 - 12x^2 + 27 = 0$

$(x^2 - 9)(x^2 - 3) = 0$

$(x+3)(x-3)(x^2-3) = 0$

$x + 3 = 0$ $\quad$ $x - 3 = 0$ $\quad$ $x^2 - 3 = 0$

$x = -3$ $\quad$ $x = 3$ $\quad$ $x = \pm\sqrt{3}$

17. $x^4 + 4x^2 + 3 = 0$

$(x^2 + 3)(x^2 + 1) = 0$

$x^2 + 3 = 0$ $\quad$ $x^2 + 1 = 0$

$x = \pm i\sqrt{3}$ $\quad$ $x = \pm i$

Simplify the following expressions.

18. $(x + 5)^2$

$(x+5)(x+5)$

$x^2 + 10x + 25$

19. $(2x - 3)^2$

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

$4x^2 - 6x - 6x + 9$

$4x^2 - 12x + 9$

Classify each polynomial by degree and by number of terms.

20. $2x^3+3x-4x^5+5x^2$

$-4x^5+2x^3+5x^2+3x$

quintic polynomial

21. $5x^3-2x^2+4x^2-3x+2x^4$

$2x^4+5x^3+2x^2-3x$

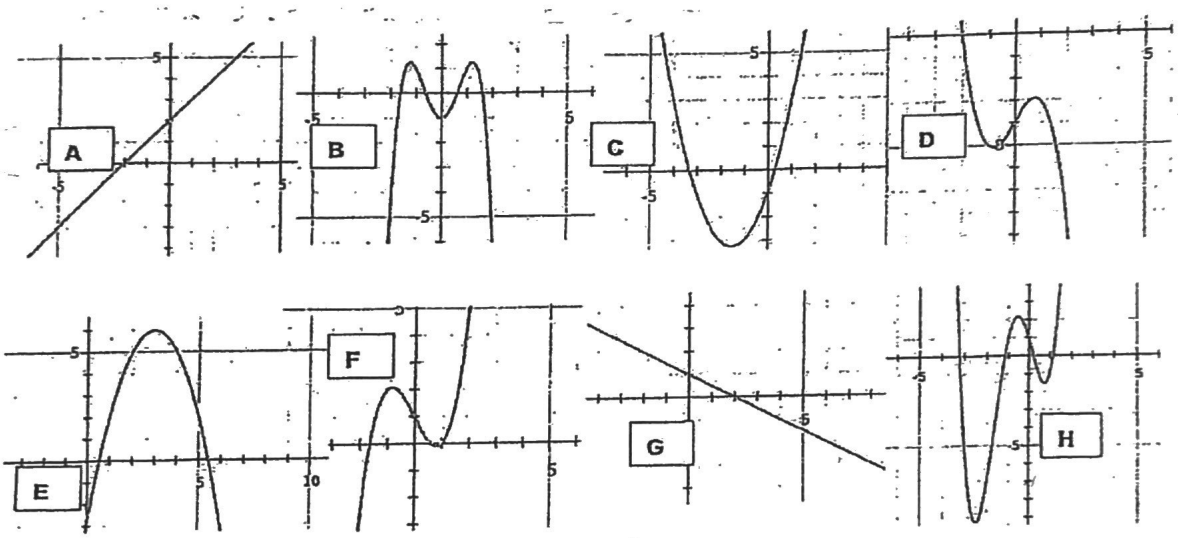
quartic polynomial

22. $6x^2-5x^3$

$-5x^3+6x^2$

cubic binomial

Write the letter of the graphs that have the same *END BEHAVIOR* as the following functions.



23. $f(x)=3x^5+4x^4-3x+1$

$+\infty \downarrow\uparrow$ A, F

24. $f(x)=-x^3+2x-1$

$-\infty \uparrow\downarrow$ D, G

25. $f(x)=-5x^4-3x^2+4x-5$

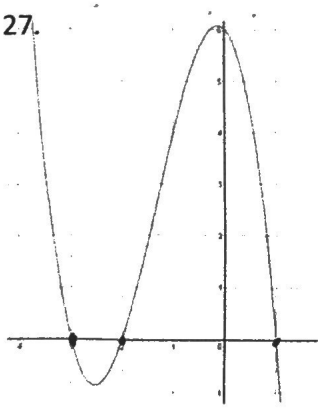
$-\infty \downarrow\downarrow$ B, E

26. $f(x)=x^6+5x^4-3x^2+7$

$+\infty \uparrow\uparrow$ C, H

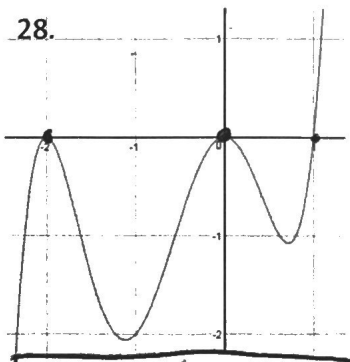
Write an equation in factored form for the following graphs.

27.



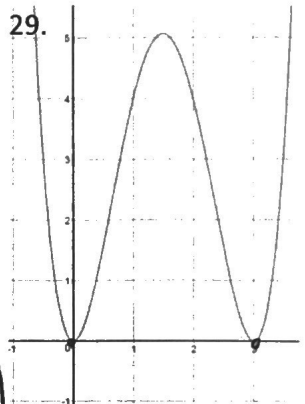
$y=-(x+3)(x+2)(x-1)$

28.



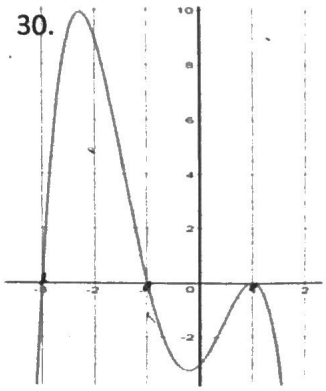
$y=x^2(x+2)^2(x-1)$

29.



$y=x^2(x-3)^2$

30.



$y=-(x+3)(x+1)(x-1)^2$

Part 2: Trig

1) Convert

a) the angle $\frac{3\pi}{5}$ from radians to degrees

$\frac{3\pi}{5} \cdot \frac{180^\circ}{\pi} = \boxed{108^\circ}$

b) the angle 310° to radians.

$310^\circ \cdot \frac{\pi}{180^\circ} = \boxed{\frac{31\pi}{18}}$

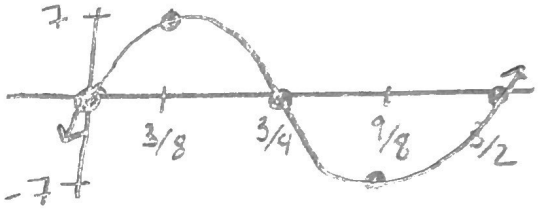
2) Graph one cycle of the function $f(x) = 7\sin\left(\frac{4\pi}{3}\theta\right)$. State the period & the amplitude, and make a table.

$a = 7 \quad b = \frac{4\pi}{3}$

amplitude $= 7$

Period $= \frac{2\pi}{1} \cdot \frac{3}{4\pi} = \frac{3}{2}$

θ	y
$0(3/2) = 0$	0
$\frac{1}{4}(3/2) = 3/8$	7
$\frac{1}{2}(3/2) = 3/4$	0
$\frac{3}{4}(3/2) = 9/8$	-7
$1(3/2) = 3/2$	0



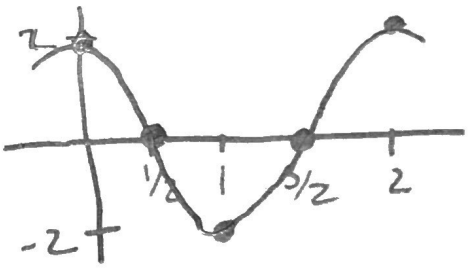
3) Graph one cycle of the function $f(x) = 2\cos(\pi\theta)$. State the period & the amplitude, and make a table.

$a = 2 \quad b = \pi$

amplitude $= 2$

Period $= \frac{2\pi}{\pi} = 2$

θ	y
$0(2) = 0$	2
$\frac{1}{4}(2) = 1/2$	0
$\frac{1}{2}(2) = 1$	-2
$\frac{3}{4}(2) = 3/2$	0
$1(2) = 2$	2



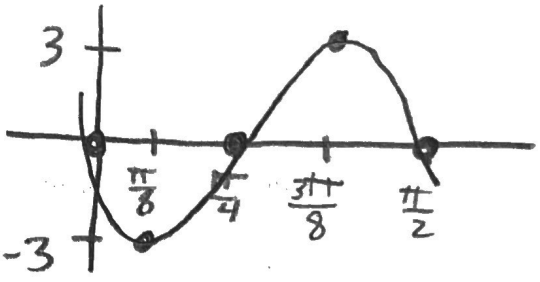
4) Graph one cycle of the function $f(x) = -3\sin(4\theta)$. State the period & the amplitude, and make a table.

$a = -3 \quad b = 4$

amplitude $= 3$

Period $= \frac{2\pi}{4} = \frac{\pi}{2}$

θ	y
$0(\pi/2) = 0$	0
$\frac{1}{4}(\pi/2) = \pi/8$	-3
$\frac{1}{2}(\pi/2) = \pi/4$	0
$\frac{3}{4}(\pi/2) = 3\pi/8$	3
$1(\pi/2) = \pi/2$	0



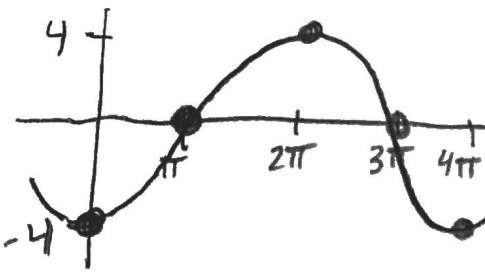
5) Graph one cycle of the function $f(x) = -4\cos\left(\frac{1}{2}\theta\right)$. State the period & the amplitude, and make a table.

$a = -4 \quad b = 1/2$

amplitude $= 4$

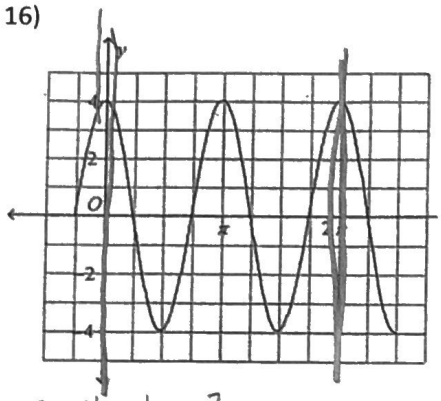
Period $= \frac{2\pi}{1} \cdot \frac{2}{1} = 4\pi$

θ	y
$0(4\pi) = 0$	-4
$\frac{1}{4}(4\pi) = \pi$	0
$\frac{1}{2}(4\pi) = 2\pi$	4
$\frac{3}{4}(4\pi) = 3\pi$	0
$1(4\pi) = 4\pi$	-4



Write an equation that satisfies the given periodic graph.

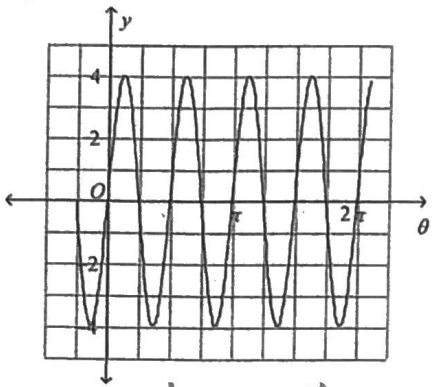
16)



$a = 4 \quad b = 2$

$y = 4\cos 2\theta$

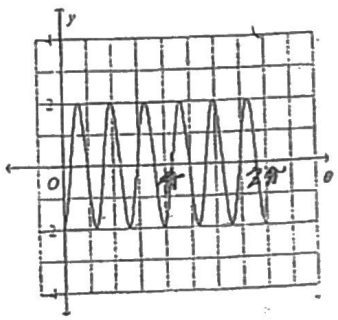
17)



$a = 4 \quad b = 4$

$y = 4\sin 4\theta$

18)



$a = -2 \quad b = 6$

$y = -2\cos 6\theta$

Write an equation that matches the given description.

13) A positive cosine function with amplitude of 3 and period of 4π.

$a = 3$

$b = \frac{2\pi}{4\pi} = \frac{1}{2}$

$y = 3\cos\frac{1}{2}\theta$

14) A negative sine function with amplitude of 4 and period of 3.

$a = -4$

$b = \frac{2\pi}{3}$

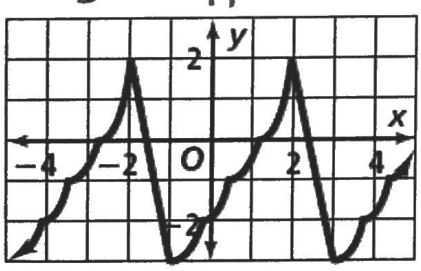
$y = -4\sin\frac{2\pi}{3}$

15) A positive sine function with amplitude of 10 and period of π.

$a = 10$

$b = \frac{2\pi}{\pi} = 2$

$y = 10\sin 2\theta$



16. Determine the period and amplitude of the graph on the left.

Period = 4

amplitude = 2.5

Find *at least* two angles that are coterminal to the given angle. There are infinit solutions. You could add/sub 360° forever!

17) 100°

460°, 820°

-260°, -620°

18) 480°

120°, 840°

-240°, -600°

19) −220°

-580°, -940°,

140°, 500°

20) −500°

-140°, -860°,

220°, 580°

Find the reference angle of the given angle.

21) 225°

225°-180° = 45°

22) 120°

180°-120°
= 60°

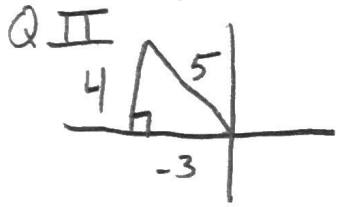
23) 330°

360°-330°
= 30°

24) 60°

60°

25) If $cos\theta = -\frac{3}{5}$ and sine is positive, find the other two trig ratios.



$(-3)^2 + b^2 = 5^2$

$9 + b^2 = 25$

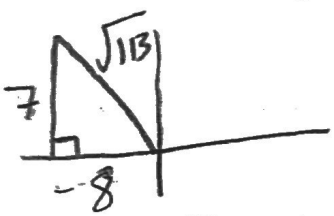
$b^2 = 16$

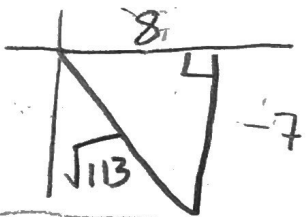
$b = 4$

$\sin\theta = \frac{4}{5}$

$\tan\theta = \frac{-3}{4}$

26) If $tan\theta = -\frac{7}{8}$ what are all the possible values of *sine* and *cosine*?





$(-7)^2 + 8^2 = c^2$

$49 + 64 = c^2$

$113 = c^2$

$c = \sqrt{113}$

$\sin\theta = \frac{7}{\sqrt{113}} \cdot \frac{\sqrt{113}}{\sqrt{113}}$

$= \frac{7\sqrt{113}}{113}$

OR $-\frac{7\sqrt{113}}{113}$

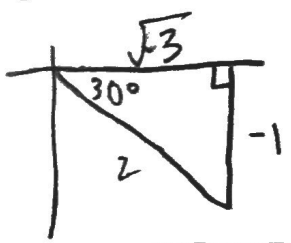
$\cos\theta = -\frac{8\sqrt{113}}{113}$

OR $\frac{8\sqrt{113}}{113}$

Find the exact value of the following:

27) $sin\frac{11\pi}{6}$ QIV

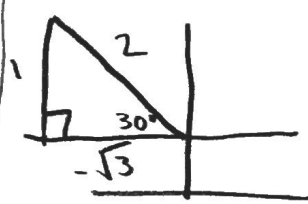
$\frac{11\pi}{6} \cdot \frac{180^\circ}{\pi} = 330^\circ$



$\sin\frac{11\pi}{6} = \frac{-1}{2}$

28) $cos\frac{5\pi}{6}$ QII

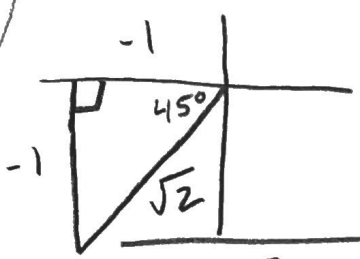
$\frac{5\pi}{6} \cdot \frac{180}{\pi} = 150^\circ$



$\cos\frac{5\pi}{6} = -\frac{\sqrt{3}}{2}$

29) $tan\frac{5\pi}{4}$ QIII

$\frac{5\pi}{4} \cdot \frac{180^\circ}{\pi} = 225^\circ$



$\tan\frac{5\pi}{4} = \frac{-1}{-1} = 1$

Part 3: Probability and Statistics

The two-way table below shows how different citizens feel about an issue on an upcoming ballot proposal. Use it to answer questions 1-4.

	Agree	Disagree	No-opinion	Total
Male	80	30	10	120
Female	60	105	15	180
Total	140	135	25	300

1) Find the probability of randomly selecting a person that is a female or disagrees with the ballot proposal.

$\frac{180 + 135 - 105}{300} = \frac{210}{300} = \frac{7}{10} = 0.70$

2) Find the probability of randomly selecting a person that is a male and has no opinion about the ballot proposal.

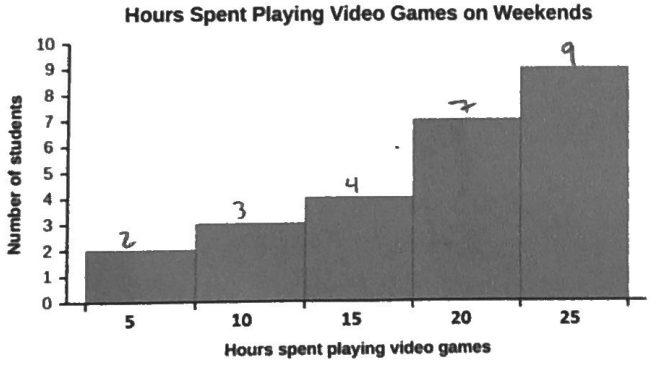
$\frac{10}{300} = \frac{1}{30} = 0.03$

3) Find the probability of randomly selecting a person that agrees with the ballot proposal given that they are a male.

$\frac{80}{120} = \frac{2}{3} = 0.67$

4) Find the probability of randomly selecting a female given that they have no opinion about the ballot proposal.

$\frac{15}{25} = \frac{3}{5} = 0.60$



Use the histogram to the left for questions 5-8.

5) Find the mean of the data.

6) Find the median of the data.

20 hours

7) Find the mode of the data.

25 Hours

8) Describe the shape of the data distribution.

left - skewed

Part 4: Rational Equations

Solve.

1) $\frac{9}{3x} = \frac{4}{x+2}$ $x \neq 0$ $x \neq -2$

$9(x+2) = 12x$

$9x + 18 = 12x$

$18 = 3x$

$\boxed{6 = x}$

2) $\frac{6}{3x-1} = \frac{3}{2x}$ $x \neq 1/3$ $x \neq 0$

$12x = 3(3x-1)$

$12x = 9x - 3$

$3x = -3$

$\boxed{x = -1}$

3) $\frac{8}{3x-2} = \frac{2}{x-1}$ $x \neq 2/3$ $x \neq 1$

$8(x-1) = 2(3x-2)$

$8x - 8 = 6x - 4$

$2x = 4$

$\boxed{x = 2}$

4) $\frac{7}{x-3} = \frac{4}{x}$ $x \neq 3$ $x \neq 0$

$7x = 4(x-3)$

$7x = 4x - 12$

$3x = 12$

$\boxed{x = 4}$

5) $\frac{1}{6x} = \frac{3}{2x} - \frac{1}{6}$ $x \neq 0$

$\frac{1}{6x} = \frac{9}{6x} - \frac{x}{6x}$

$1 = 9 - x$

$\boxed{x = 8}$

6) $\frac{1}{3} - \frac{1}{x} = 1$ $x \neq 0$

$\frac{x}{3x} - \frac{3}{3x} = \frac{3x}{3x}$

$x - 3 = 3x$

$-3 = 2x$

$\boxed{x = -3/2}$

7) $\frac{x+5}{4x} + \frac{11}{12} = \frac{2}{3x}$ $x \neq 0$

$\frac{3(x+5)}{12x} + \frac{11x}{12x} = \frac{8}{12x}$

$3x + 15 + 11x = 8$

$14x = -7$

$\boxed{x = -1/2}$

8) $\frac{x}{2x+6} - \frac{1}{x+3} = 1$ $x \neq -3$

$2(x+3)$

$\frac{x}{2x+6} - \frac{2}{2x+6} = \frac{2x+6}{2x+6}$

$x - 2 = 2x + 6$

$\boxed{-8 = x}$