Algebra 2 – Final Exam Review
Cumulative Exam
Green Book: Chapters 1 – 7, 9

You get one sheet of paper (front and back) to help you with this exam.

- You only get 1.
- You may put whatever you want on this paper to help you.
- You must turn in your paper with your exam.

Units 1/2 – Linear Functions

- Applying
- Solving
- Graphing

Units 3 – Systems of Equations

- Applying
- Solving
    - Graphing
    - Substitution
    - Linear Combination

Units 4 – Matrices

- Adding, Subtracting, Multiplying
- Cramer's Rule
- Applying

Unit 5 – Quadratic Functions

- Applying
- Solving
- Graphing

Unit 6 – Exponential Functions & Logarithms

- Applying
- Solving
- Graphing

Unit 7 – Polynomials & Rational Expressions

Part 1 – Polynomials

- Applying
- Solving
- Graphing

Part 2 – Rational Expressions

- Simplifying, Multiplying, & Dividing
- Adding & Subtracting
- Complex Fractions
- Solving

Extra Review Questions

1. Using $A = P\left(1+\frac{r}{n}\right)^{nt}$, if you invest \$1500 for 16 years at 2.5%, how much is it worth if it's compounded monthly?

$1500\left(1+\frac{0.025}{12}\right)^{(16\cdot12)} = \$2236.81$

2. Using $A = Pe^{rt}$, If you invest \$6500 for 30 years at 3.5%, how much is it worth if it's compounded continuously?

$6500e^{(30\cdot0.035)} = \$18,574.73$

3. Using $pH = -1\cdot\log(H^+)$, what is the hydrogen ion concentration of coffee that's pH is 6.25?

$\frac{6.25}{-1} = \frac{-1\cdot\log H^+}{-1}$ $\quad -6.25 = \log H^+$

$H^+ = 10^{-6.25} = 5.62\times10^{-7}$

4. Using $pH = -1\cdot\log(H^+)$, what is the pH of a garden soil that has a hydrogen ion concentration of 7.9×10^{-6}?

$pH = -1\cdot\log(7.9\times10^{-6}) = 5.1$

5. Using $A = Pe^{rt}$, how many years would it take to triple an investment earning 2% interest compounded continuously?

$3 = e^{0.02t}$

$\ln 3 = \ln e^{0.02t}$

$\frac{\ln 3}{0.02\ln e} = \frac{0.02t\ln e}{0.02\ln e}$

$t = 54.93$ years

6. Using $A = Pe^{rt}$, at what rate would you need to invest to quadruple an investment in 35 years compounded continuously?

$4 = e^{35r}$

$\ln 4 = \ln e^{35r}$

$\frac{\ln 4}{35\ln e} = \frac{35r\ln e}{35\ln e}$

$r = 0.0396 \rightarrow 3.96\%$

7. There are initially 2500 bacteria in a culture, and the number of bacteria triples each hour. The number of bacteria after t hours. How many bacteria will there be in 5 hours?

$2500(3)^5 = 607,500$

8. The chemical element Caesium (Cs) has a ***half***-life of about 30 years. Caesium is highly reactive to water. A concentration of 360 Kg is found. How many years before the concentration is below 20 Kg?

$t=0$	360
$t=1$	180
$t=2$	90
$t=3$	45
$t=4$	22.5
$t=5$	11.25

5 Half-Lives

150 years

Algebra 2 - Final Exam Review

Solve each system by elimination.

1) $7x - 10y = -5$
$-5x + 10y = -5$

$2x = -10$
$\frac{2x}{2} = \frac{-10}{2}$
$x = -5$

$-5(-5) + 10y = -5$
$25 + 10y = -5$
$10y = -30$
$y = -10$

$(-5, -10)$

2) $-8x - 2y = -28$ $\times 2$
$16x - 5y = 2$

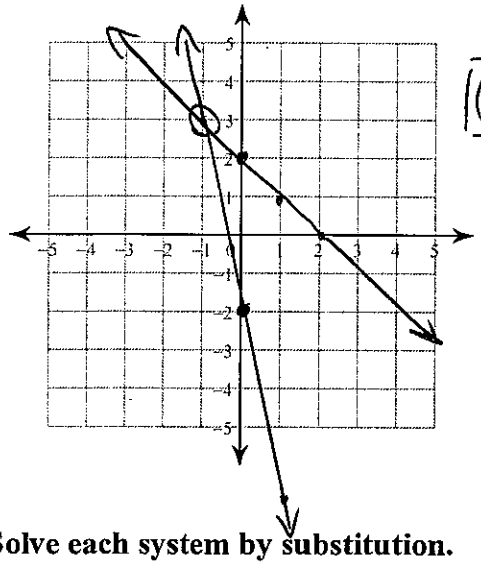
$-16x - 4y = -56$
$16x - 5y = 2$
$-9y = -54$
$\frac{-9y}{-9} = \frac{-54}{-9}$
$y = 6$

$16x - 5(6) = 2$
$16x - 30 = 2$
$16x = 32$
$x = 2$

$(2, 6)$

Solve each system by graphing.

3) $y = -5x - 2$
$y = -x + 2$



$(-1, 3)$

Solve each system by substitution.

4) $y = 6$
$7x + 3y = -17$

$(-5, 6)$

$7x + 3(6) = -17$
$7x + 18 = -17$
$7x = -35$
$x = -5$

5) Natalie and Julia each improved their yards by planting hostas and shrubs. They bought their supplies from the same store. Natalie spent \$165 on 8 hostas and 7 shrubs. Julia spent \$165 on 4 hostas and 11 shrubs. What is the cost of one hosta and the cost of one shrub?

$8H + 7S = 165 \rightarrow 8H + 7S = 165$
$-2 \times (4H + 11S = 165) \rightarrow -8H - 22S = -330$
$-15S = -165$
$S = 11$

$4H + 11(11) = 165$
$4H + 121 = 165$
$4H = 44$
$H = 11$

\$11 each

6) Kayla and Joe each improved their yards by planting daylilies and shrubs. They bought their supplies from the same store. Kayla spent \$56 on 10 daylilies and 3 shrubs. Joe spent \$136 on 2 daylilies and 11 shrubs. What is the cost of one daylily and the cost of one shrub?

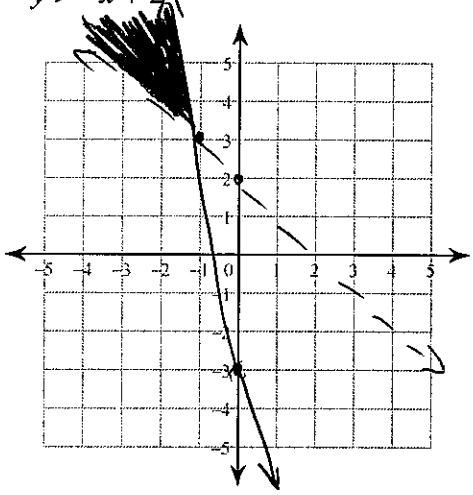
$10D + 3S = 56 \rightarrow 10D + 3S = 56$
$-5 \times (2D + 11S = 136) \quad -10D - 55S = -680$
$-52S = -624$
$S = 12$

$10D + 3(12) = 56$
$10D + 36 = 56$
$10D = 20$
$D = 2$

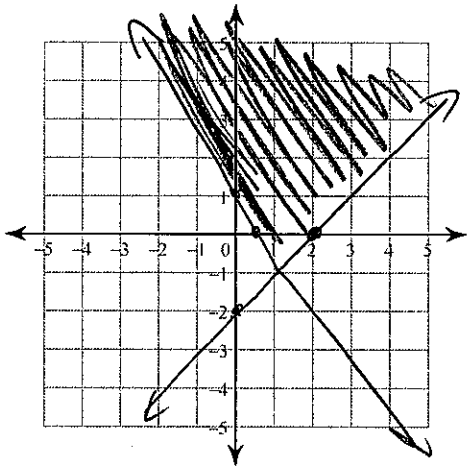
Shrubs = \$12

Sketch the solution to each system of inequalities.

7) $y \le -6x - 3$
$y > -x + 2$



8) $x - y \le 2$
$2x + y \ge 1$



Use Cramer's Rule to solve each system.

9) $x - 5y = -4$
$-4x = 11$

$\begin{vmatrix} 1 & -5 \\ -4 & 0 \end{vmatrix} = 0 - 20 = -20$

$D = -20$

$\begin{vmatrix} -4 & -5 \\ 11 & 0 \end{vmatrix} = 0 - -55 = \frac{55}{-20} = -3.75$ (x)

$\begin{vmatrix} 1 & -4 \\ -4 & 11 \end{vmatrix} = 11 - 16 = \frac{-5}{-20} = 0.25$ (y)

$(-3.75, 0.25)$

Simplify. Write "undefined" for expressions that are undefined.

10) $[-6 \quad -3 \quad 4 \quad -6] + [1 \quad -3 \quad 5 \quad 0]$

$[-5 \quad -6 \quad 9 \quad -6]$

11) $\begin{bmatrix} 2 \\ 0 \\ -4 \\ -3 \end{bmatrix} + \begin{bmatrix} 6 \\ -4 \\ -1 \\ -3 \end{bmatrix} = \begin{bmatrix} 8 \\ -4 \\ -5 \\ -6 \end{bmatrix}$

12) $[1 \quad 5] - [2 \quad 4]$

$[-1 \quad 1]$

$3 \times 1 = 1 \times 2$

13) $\begin{bmatrix} -6 \\ -1 \\ -1 \end{bmatrix} \cdot \begin{bmatrix} -6 & 1 \end{bmatrix}$ 3×2

$\begin{bmatrix} 36 & -6 \\ 6 & -1 \\ 6 & -1 \end{bmatrix}$

Write the slope-intercept form of the equation of each line given the slope and y-intercept.

14) Slope $= -\frac{6}{5}$, y-intercept $= -4$

$y = -\frac{6}{5}x - 4$

Write the slope-intercept form of the equation of the line through the given point with the given slope.

15) through: $(-4, 0)$, slope $= -\frac{3}{4}$

$0 = \frac{-3}{4}(-4) + b$

$0 = 3 + b$

$-3 = b$

$y = \frac{-3}{4}x - 3$

Write the slope-intercept form of the equation of the line through the given points.

16) through: $(4, 3)$ and $(-4, -2)$ (x_1, y_1 x_2, y_2)

$m = \frac{-2-3}{-4-4} = \frac{-5}{-8} = \frac{5}{8}$

$3 = \frac{5}{8}(4) + b$

$3 = 2.5 + b$

$-2.5 \quad -2.5$

$0.5 = b$

$y = \frac{5}{8}x + \frac{1}{2}$

Write the slope-intercept form of the equation of the line described.

17) through: $(5, 4)$, parallel to $y = x$

$m = 1$ (SAME SLOPE)

$4 = 1(5) + b$

$-5 \quad -5$

$-1 = b$

$y = x - 1$

18) through: $(4, 3)$, perp. to $y = -x - 1$ (opposite reciprocal slope)

$3 = 1(4) + b$

$-4 \quad -4$

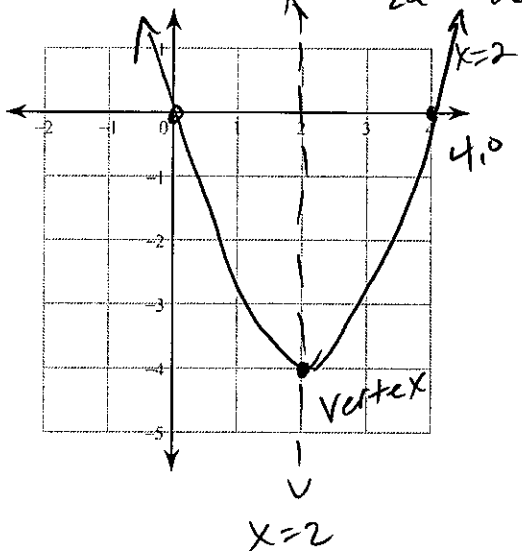
$-1 = b$

$y = x - 1$

Sketch the graph of each function. Identify the vertex, x-intercept, y-intercept, axis of symmetry, and a symmetric point.

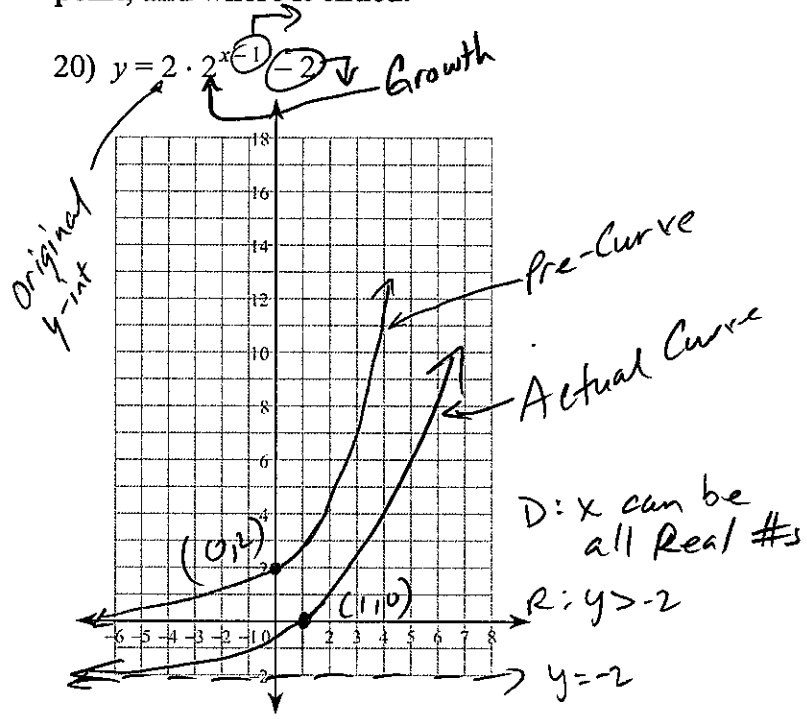
19) $y = x^2 - 4x + 0$

$x = \frac{-b}{2a} = \frac{-(-4)}{2(1)}$



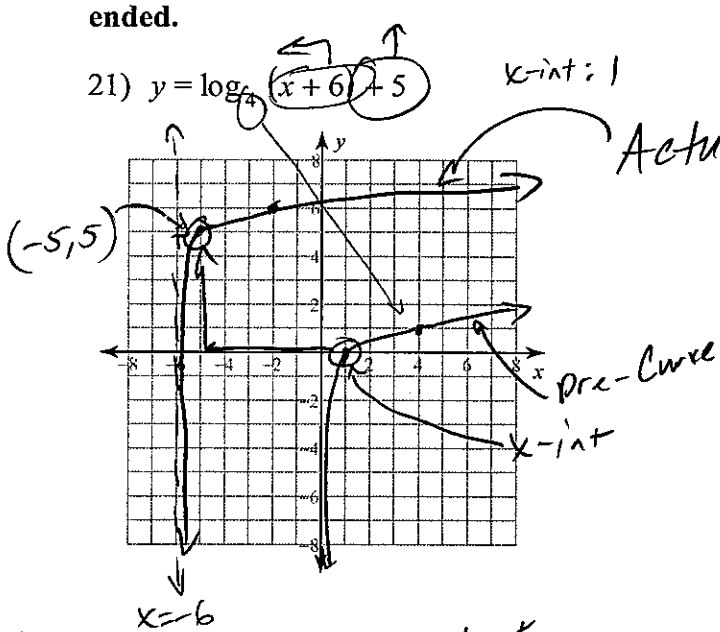
Sketch the graph of each function. Identify the domain, range, asymptote, beginning point, and where it ended.

20) $y = 2 \cdot 2^{x-1} - 2$



Sketch the graph. Identify the domain, range, asymptote, beginning point and where it ended.

21) $y = \log_4(x+6) + 5$



D: $x > -6$

R: y can be all Real #s

Solve by factoring.

22) $m^2 + m - 12 = 0$

Sum, Product

$(m+4)(m-3)$

Solve usnig the quadratic formula.

23) $3v^2 - 7v - 98 = 0$

$a = 3$

$b = -7$

$c = -98$

$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(3)(-98)}}{2(3)}$

$x = \frac{7 \pm \sqrt{1225}}{6} = \frac{7 \pm 35}{6}$

$\frac{7+35}{6} = 7$

$\frac{7-35}{6} = -4$

Solve the equation. Round your answers to 3 decimal places.

24) $8^{x-8.1} - 5.8 = 73.8$

$x - 8.1$

$(x-8.1)\log 8 = \log 79.6$

$\frac{(x-8.1)\log 8}{\log 8} = \frac{\log 79.6}{\log 8}$

$x - 8.1 = 2.1$

$+8.1 \quad +8.1$

$x = 10.2$

Solve the equation.

25) $\log_6(a+5) + 1 = 1$

$-1 \quad -1$

$\log_6(a+5) = 0$

$6^0 = a+5$

$1 = a+5$

$-5 \quad -5$

$-4 = a$

Simplify each sum.

26) $(7r - 6r^4 - 2r^3) + (4r^4 - 3r^3 + 5r)$

$-2r^4 - 5r^3 + 12r$

Simplify each difference.

27) $(5x^2 + 4 - 2x^3) - (6x^3 - 6x^2 - 8)$

$-2x^3 - 6x^3 \mid 5x^2 - -6x^2 \mid 4 - -8$

$-8x^3 + 11x^2 + 12$

Find each product.

28) $5(3k^2 - 5k + 7)$

$15k^2 - 25k + 35$

29) $(8p + 8)(p + 7)$

$8p^2 + 56p + 8p + 56$

$8p^2 + 64p + 56$

Find all roots.

30) $x(5x + 1)(x + 4) = 0$

$x = 0 \mid 5x + 1 = 0 \mid x + 4 = 0$

$-1 \quad -1 \quad -4 \quad -4$

$\frac{5x}{5} = \frac{-1}{5} \quad x = -4$

$x = -\frac{1}{5}$ or -0.2

Find all of the solutions given that f(0) = 0.

31) $f(x) = 5x^3 - 18x^2 + 9x$

	5	−18	9	0
0	↓	0	0	0
	$5x^2$	$-18x$	$+9$	0

$a = 5$

$b = -18$

$c = 9$

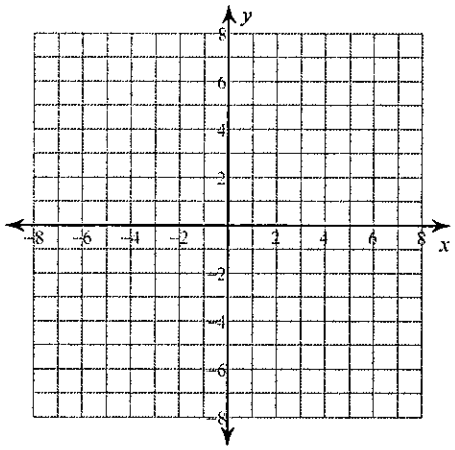
$x = \frac{-(-18) \pm \sqrt{(-18)^2 - 4(5)(9)}}{2(5)}$

$x = \frac{18 \pm \sqrt{144}}{10} \rightarrow \frac{18 \pm 12}{10}$

$\frac{18+12}{10} = 3 \qquad \frac{18-12}{10} = 0.6$

Solve and graph the function. f(1) = 0 and f(1) = 0. Label the x- and y-intercepts.

32) $f(x) = -x^4 - 2x^3 + x^2 - 4$



	-1	-2	1	0	-4
1	↓	-1	-3	-2	-2
	-1	-3	-2	-2	-6

oops

I apologize, but 1 is NOT a solution. The program switched my equation.

Simplify each expression. FACTOR/CANCEL

33) $\dfrac{k^2 - k - 12}{k - 4} \cdot \dfrac{3}{k + 3}$

$\dfrac{(k-4)(k+3)}{k-4} \cdot \dfrac{3}{k+3}$

3

34) $\dfrac{p + 2}{p^2 - 11p + 18} \div \dfrac{1}{p - 9}$

$\dfrac{p+2}{(p-9)(p-2)} \cdot \dfrac{p-9}{1} = \dfrac{p+2}{p-2}$

35) $\dfrac{x - 2}{12x^2 + 36x} + \dfrac{x - 2}{12x^2 + 36x}$

CD

$\dfrac{2x-4}{12x^2+36x}$

36) $\dfrac{v + 1}{v^2 - 3v + 2} - \dfrac{5v + 6}{v^2 - 3v + 2}$

CD

$\dfrac{-4v-5}{v^2-3v+2}$

X - 5v
1 - 6

$CD=(x-5)(2x+2)$

37) $\frac{4}{x-5}+\frac{6x}{2x+2}$ $(2x+2)$ $(x-5)$

$\frac{4(2x+2)}{CD}+\frac{6x(x-5)}{CD}$

$\frac{8x+8+6x^2-30x}{CD}=\frac{6x^2-22x+8}{(x-5)(2x+2)}$

$CD=(n+1)(n+3)$

38) $\frac{3n}{n+1}$ $(n+3)$ $-\frac{6n}{n+3}$ $(n+1)$

$\frac{3n(n+3)}{CD}-\frac{6n(n+1)}{CD}$

$\frac{3n^2+9n}{CD}-\frac{6n^2+6n}{CD}=\frac{-3n^2+3n}{(n+1)(n+3)}$

39) $\frac{\frac{2a-3}{9}-\frac{1}{a}}{\frac{5a(2a-3)}{5\cdot 9\cdot a}}$ $9\cdot 5\cdot a(2a-3)$

$\frac{3}{2a-3}-\frac{9}{5}$ $9a(2a-3)$

$\frac{5a(2a-3)(2a-3)}{CD}-\frac{45(2a-3)}{CD}$

$\frac{135a}{CD}-\frac{81a(2a-3)}{CD}$

$=\frac{5a(4a^2-6a-6a+9)-45(2a-3)}{135a-81a(2a-3)}$

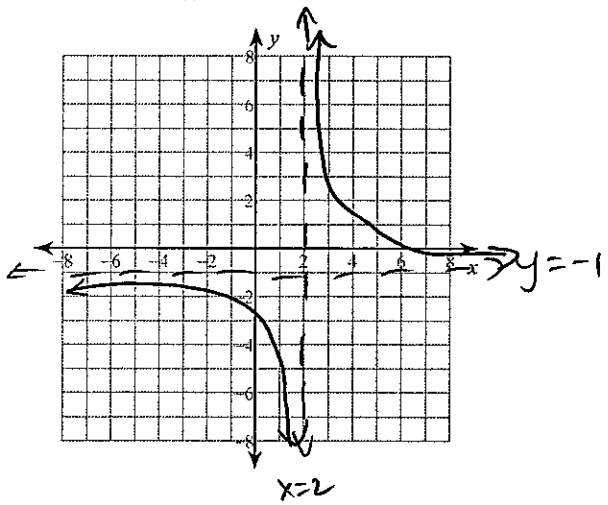
$=\frac{20a^3-60a^2+45a-90a+135}{135a-162a^2+243a}=\frac{20a^3-60a^2-45+1}{-162a^2+378a}$

Identify the vertical asymptotes, horizontal asymptote, domain, and range of each. Then sketch the graph. $x=2$ $y=-1$

40) $f(x)=\frac{2}{x-2}-1$

D: $x\neq 2$

R: $y\neq -1$



Simplify each expression.

41) $\frac{v^2+5v-24}{v^2-11v+24}$ sum, product $\frac{(v+8)(v-3)}{(v-8)(v-3)}$

$\frac{v+8}{v-8}$

42) $\frac{n^2-16}{n^2+n-12}$ $\frac{(n-4)(n+4)}{(n+4)(n-3)}$

$\frac{n-4}{n-3}$

Solve each equation. Remember to check for extraneous solutions.

43) $\frac{2v}{v} = \frac{1}{v^2} - \frac{15v+18}{v^2}$ $v \neq 0$ $CD = v^2$

$2v = 1 - 15v - 18$

$2v = -15v - 17$

$+15v \quad +15v$

$17v = -17$

$\frac{17v}{17} = \frac{-17}{17}$

$v = -1$

44) $\frac{2}{x^2+4x} = \frac{1}{x^2+4x} - \frac{1}{x}$ $x \neq 0, -4$ $CD = x(x+4)$

$x(x+4) \quad x(x+4) \quad x \quad x+4$

$\frac{2}{CD} = \frac{1}{CD} - \frac{x+4}{CD}$

$2 = 1 - x - 4$

$2 = -x - 3$

$+3 \quad +3$

$5 = -x$

$\frac{5}{-1} = \frac{-x}{-1}$

$-5 = x$

45) $\frac{n-5}{n} = \frac{n-2}{n+6} + \frac{1}{n^2+6n}$ $n \neq 0, -6$ $CD = n(n+6)$

$n+6 \quad n \quad n+6$

$\frac{(n+6)(n-5)}{CD} = \frac{n(n-2)}{CD} + \frac{1}{CD}$

$n^2 - 5n + 6n - 30 = n^2 - 2n + 1$

$n^2 + n - 30 = n^2 - 2n + 1$

$-n^2 \qquad -n^2$

$n - 30 = -2n + 1$

$+2n \quad +30 \quad +2n \quad +30$

$\frac{3n}{3} = \frac{31}{3}$

$n = 10.3$

46) $1 = \frac{a+2}{a} - \frac{1}{a^2}$ $a \neq 0$ $CD = a^2$

$a^2 \quad a \quad a \quad a^2$

$\frac{a^2}{a^2} = \frac{a(a+2)}{a^2} - \frac{1}{a^2}$

$a^2 = a^2 + 2a - 1$

$-a^2 \quad -a^2$

$0 = 2a - 1$

$+1 \quad +1$

$\frac{1}{2} = \frac{2a}{2}$

$\frac{1}{2} = a$

or

$0.5 = a$