# 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 $7.9\times10^{-6}$?

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

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

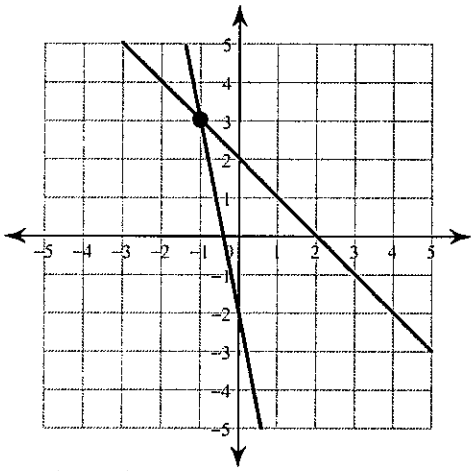
$(-5, -3)$

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

$(2, 6)$

**Solve each system by graphing.**

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



$(-1, 3)$

**Solve each system by substitution.**

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

$(-5, 6)$

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?

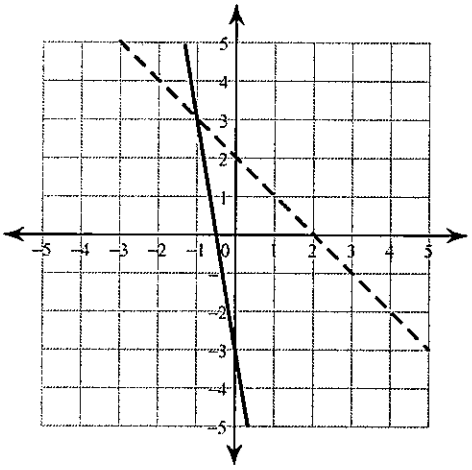
hosta: $11, shrub: $11

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?

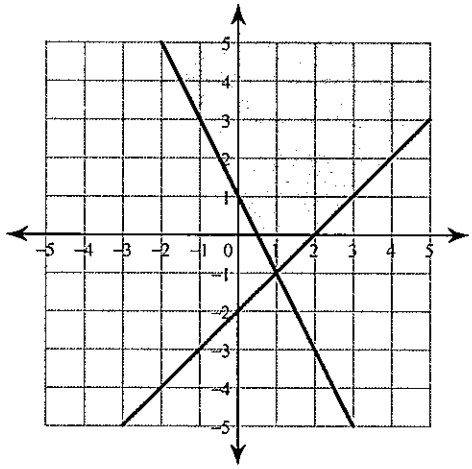
daylily: $2, shrub: $12

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

$\left(-\frac{11}{4}, \frac{1}{4}\right)$

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

10) $\begin{bmatrix} -6 & -3 & 4 & -6 \end{bmatrix} + \begin{bmatrix} 1 & -3 & 5 & 0 \end{bmatrix}$
$\begin{bmatrix} -5 & -6 & 9 & -6 \end{bmatrix}$

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) $\begin{bmatrix} 1 & 5 \end{bmatrix} - \begin{bmatrix} 2 & 4 \end{bmatrix}$
$\begin{bmatrix} -1 & 1 \end{bmatrix}$

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

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

**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 $= -\frac{3}{4}$

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

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

16) through: $(4, 3)$ and $(-4, -2)$ $y = \frac{5}{8}x + \frac{1}{2}$

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

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

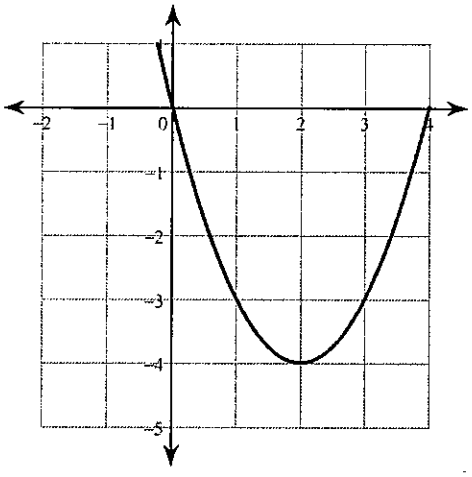
$y = x - 1$

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

$y = x - 1$

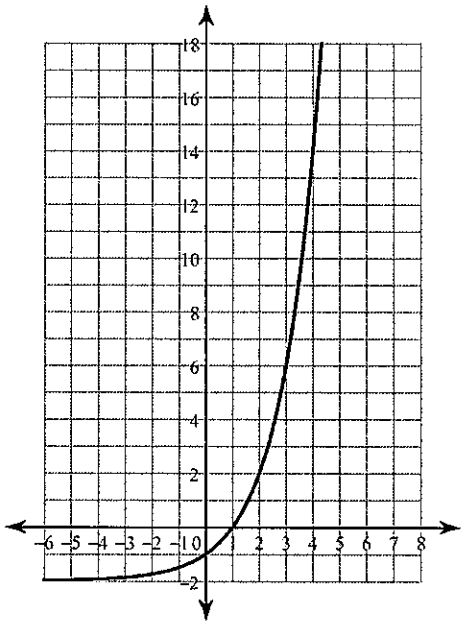
**Sketch the graph of each function. Identify the vertex, x-intercept, y-intercept, axis of symmetry, and a symmetric point.**

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



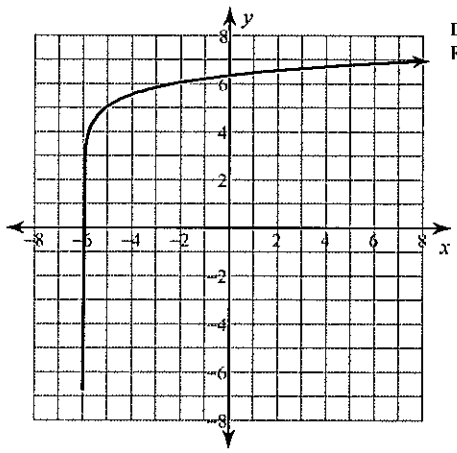
**Sketch the graph of each function. Identify the domain, range, asymptote, beginning point, and where it ended.**

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



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

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



Domain: $x > -6$
Range: All reals

**Solve by factoring.**

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

$\{3, -4\}$

**Solve usnig the quadratic formula.**

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

$\left\{7, -\frac{14}{3}\right\}$

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

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

10.2049

**Solve the equation.**

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

{31}

**Simplify each sum.**

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

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

**Simplify each difference.**

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

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

**Find each product.**

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

$15k^2 - 25k + 35$

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

$8p^2 + 64p + 56$

**Find all roots.**

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

$\left\{0, -\frac{1}{5}, -4\right\}$

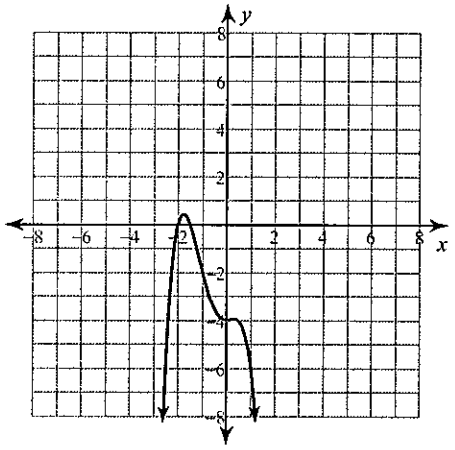
**Find all of the solutions given that f(0) = 0.**

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

$\left\{0, \frac{3}{5}, 3\right\}$

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

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




**Simplify each expression.**

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

3

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

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

$\dfrac{x - 2}{6x^2 + 18x}$

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

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

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

$\dfrac{-11x+4+3x^2}{(x+1)(x-5)}$

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

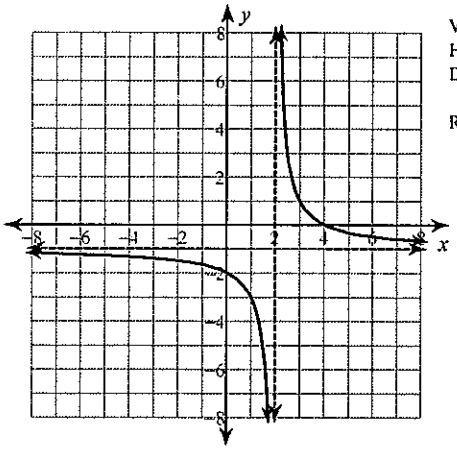
$\dfrac{-3n^2+3n}{(n+1)(n+3)}$

39) $\dfrac{\dfrac{2a-3}{9}-\dfrac{1}{a}}{\dfrac{3}{2a-3}-\dfrac{9}{5}}$

$\dfrac{20a^3-60a^2-45a+135}{378a-162a^2}$

**Identify the vertical asymptotes, horizontal asymptote, domain, and range of each. Then sketch the graph.**

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




Vertical Asym.: $x=2$
Horz. Asym.: $y=-1$
Domain:
All reals except 2
Range:
All reals except $-1$

**Simplify each expression.**

41) $\dfrac{v^2+5v-24}{v^2-11v+24}\ \dfrac{v+8}{v-8}$

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

**Solve each equation. Remember to check for extraneous solutions.**

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

$\{-1\}$

44) $\frac{2}{x^2+4x} = \frac{1}{x^2+4x} - \frac{1}{x}$

$\{-5\}$

45) $\frac{n-5}{n} = \frac{n-2}{n+6} + \frac{1}{n^2+6n}$ $\left\{\frac{31}{3}\right\}$

46) $1 = \frac{a+2}{a} - \frac{1}{a^2}$ $\left\{\frac{1}{2}\right\}$