

Advanced Algebra  
Final Exam Review 1

$$A = Pert$$

$$A = P(1 \pm r)^t$$

$$A = P\left(1 \pm \frac{r}{n}\right)^{nt}$$

**Logarithms**

Write as an exponential equation.

1.  $\log_4 \frac{1}{64} = -3$       2.  $\log_x 3 = 2$       3.  $\ln 148 = 5$       4.  $\log x = 7$

Write as a logarithmic equation.

5.  $13^2 = 169$       6.  $6^x = 3.6$       7.  $e^3 = 20.1$

Expand using the properties of logs.

8.  $\ln 2x^2y$       9.  $\log \frac{15x}{\sqrt{y}}$       10.  $\log_2 \frac{z}{x^3y}$

Condense using the properties of logs.

11.  $\log_8 5 + \log_8 3$       12.  $\frac{1}{3} \log x - \log 2$       13.  $\ln 3 - 4 \ln x - \frac{1}{2} \ln y$

Evaluate the following.

14.  $\log 10000$       15.  $\log_9 1$       16.  $5^{\log_5 4}$   
17.  $\ln e^{1.7}$       18.  $\log_2 8$       19.  $e^{\ln 3}$

Solve the following log equations.

20.  $\log_4 x = 3$       21.  $\log_3(2x+5) = 2$       22.  $\log_4(2x-1) = \log_4 16$   
23.  $\log_8(x^2-2) = \log_8 7$       24.  $\log_2 4 + \log_2 6 = \log_2 x$       25.  $\log_3 x - \log_3 12 = \log_3 3$

Graph the following log functions. Identify the equation of the asymptote.

26.  $y = \log x$       27.  $y = \log(x-2)$       28.  $y = \log(x+1) - 3$

**Answers:**

1.  $4^{-3} = \frac{1}{64}$       2.  $x^2 = 3$       3.  $e^5 = 148$       4.  $10^7 = x$       5.  $\log_{13} 169 = 2$       6.  $\log_6 3.6 = x$   
7.  $\ln 20.1 = 3$       8.  $\ln 2 + 2 \ln x + \ln y$       9.  $\log 15 + \log x - \frac{1}{2} \log y$       10.  $\log_2 z - 3 \log_2 x - \log_2 y$   
11.  $\log_8 15$       12.  $\log \frac{\sqrt[3]{x}}{2}$       13.  $\ln \frac{3}{x^4 \sqrt{y}}$       14. 4      15. 0      16. 4      17. 1.7  
18. 3      19. 3      20. 64      21. 2      22.  $\frac{17}{2}$       23.  $\pm 3$       24. 24      25. 36      26.  $x = 0$       27.  $x = 2$       28.  $x = -1$

**Inverse Functions, Exponential & Logarithmic Functions**

Graph the inverse and identify domain and range.

1. **Function**  
D: \_\_\_\_\_  
R: \_\_\_\_\_  
**Inverse**  
D: \_\_\_\_\_  
R: \_\_\_\_\_

2. **Function**  
D: \_\_\_\_\_  
R: \_\_\_\_\_  
**Inverse**  
D: \_\_\_\_\_  
R: \_\_\_\_\_

Find the inverse of each equation.

3.  $y = \frac{1}{2}x - 5$       4.  $y = (x-2)^3 + 1$       5.  $y = e^{x-3} + 1$       6.  $y = 3 + \log_4 x$

Fill in the blank.

7. If  $(-3, 1)$  is on  $f$ , then \_\_\_\_\_ is on  $f^{-1}$ .  
8. If  $y \geq -2$  is the range of  $f$ , then \_\_\_\_\_ is the domain of  $f^{-1}$ .

Suppose  $f(x) = 3x - 5$  and  $g(x) = x^2 + 7$ , find

9.  $f(g(2))$       10.  $g(f(-1))$       11.  $f(g(x))$       12.  $g(f(x))$

Graph and identify characteristics.

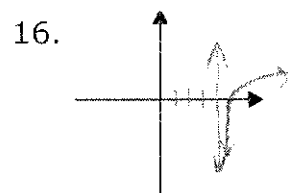
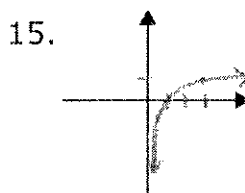
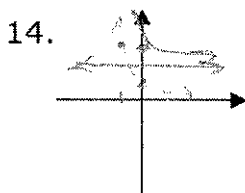
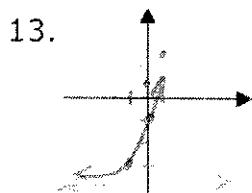
13.  $y = 3^{x+1} - 4$     Domain: \_\_\_\_\_ Range: \_\_\_\_\_ Asymptote: \_\_\_\_\_ Intercept: \_\_\_\_\_  
14.  $y = \left(\frac{1}{3}\right)^x + 2$     Domain: \_\_\_\_\_ Range: \_\_\_\_\_ Asymptote: \_\_\_\_\_ Intercept: \_\_\_\_\_  
15.  $y = \log_3 x$     Domain: \_\_\_\_\_ Range: \_\_\_\_\_ Asymptote: \_\_\_\_\_  
16.  $y = \log_3(x-4)$     Domain: \_\_\_\_\_ Range: \_\_\_\_\_ Asymptote: \_\_\_\_\_

**Answers:**

1. **Function**  
D:  $x \geq -1$   
R:  $y \geq 0$   
**Inverse**  
D:  $x \geq 0$   
R:  $y \geq -1$

2. **Function**  
D:  $x \geq 1$   
R:  $y \geq 1$   
**Inverse**  
D:  $x \geq 1$   
R:  $y \geq 1$

3.  $y = 2x + 10$       4.  $y = \sqrt[3]{x-1} + 2$       5.  $y = \ln(x-1) + 3$       6.  $y = 4^{x-3}$       7.  $(1, -3)$   
8.  $x \geq -2$       9. 28      10. 71      11.  $3x^2 + 16$       12.  $9x^2 - 30x + 32$



Dom: R; Ran:  $y > -4$     Dom: R; Ran:  $y > 2$   
Asy:  $y = -4$ ; Int:  $(0, -1)$     Asy:  $y = 2$ ; Int:  $(0, 3)$

Dom:  $x > 0$ ; Ran: R  
Asy:  $x = 0$ ; Int:  $(1, 0)$

Dom:  $x > 4$ ; Ran: R  
Asy:  $x = 4$ ; Int:  $(5, 0)$

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Rational Expressions & Equations

1. State the excluded value(s) of  $x$ :  $\frac{x-3}{x^2-x-6}$

Simplify each expression.

2.  $\frac{9x^2y}{13} \cdot \frac{26}{3xy^2}$

3.  $\frac{\frac{16x^2-1}{2x^2-7x-15}}{\frac{4x^2+9x+2}{8x^2-40x}}$

4.  $\frac{x^2-2x-35}{x+3} \div \frac{x-7}{x^2+5x+6}$

5.  $\frac{x^2+3x}{x^2+5x+6} + \frac{4}{x+2}$

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

Solve each equation.

7.  $\frac{3}{2m} = \frac{m+1}{4m}$

8.  $\frac{2x}{x-1} - 2 = \frac{10}{x+2}$

9. Graph  $y = \frac{x^2 + 2x + 3}{x - 1}$

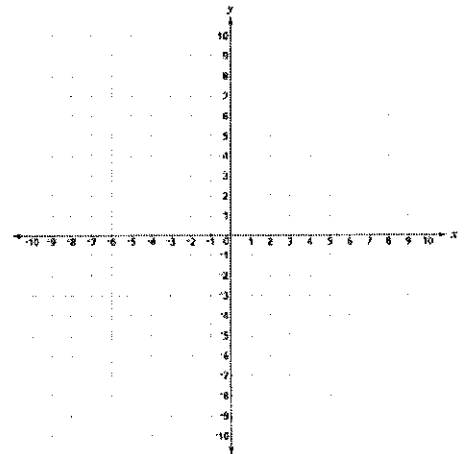
a) coordinate of hole: \_\_\_\_\_

b) y-int: \_\_\_\_\_

c) equation of vertical asymptote: \_\_\_\_\_

d) zero(s): \_\_\_\_\_

e) equation of horizontal/slant asymptote: \_\_\_\_\_



10. Graph  $y = \frac{x^2 - 6x + 9}{2x^2 - 2x - 12}$

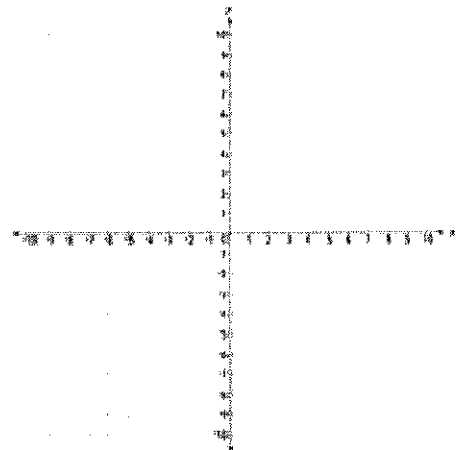
a) coordinate of hole: \_\_\_\_\_

b) y-int: \_\_\_\_\_

c) equation of vertical asymptote: \_\_\_\_\_

d) zero(s): \_\_\_\_\_

e) equation of horizontal/slant asymptote: \_\_\_\_\_



Rational Expressions & Equations

1. State the excluded value(s) of  $x$ :  $\frac{x-3}{x^2-x-6}$   
 $(x-3)(x+2)$  
 $x \neq 3$   
 $x = -2$

Simplify each expression.

2.  $\frac{3 \cancel{9}x^2y \cdot \cancel{26}2}{\cancel{1} \cancel{3} \cancel{3}xy^2} = \frac{6x^2y}{xy^2} = \boxed{\frac{6x}{y}}$

3.  $\frac{16x^2-1}{\frac{2x^2-7x-15}{4x^2+9x+2} \cdot \frac{8x(x-5)}{(x+2)(4x+1)}}$   
 $\frac{8x^2-49x+30}{(x-5)(2x+3)} \cdot \frac{8x(x-5)}{(x+2)(4x+1)} = \boxed{\frac{8x(4x-1)}{(2x+3)(x+2)}}$

$\frac{x^2-7x-30}{(x-10)(x+3)}$       $\frac{x^2+9x+8}{(x+8)(x+1)}$

4.  $\frac{x^2-2x-35}{x+3} \div \frac{x-7}{x^2+5x+6} = \frac{(x-7)(x+5)}{x+3} \cdot \frac{(x+3)(x+2)}{(x-7)} = \boxed{(x+5)(x+2)}$

5.  $\frac{x^2+3x}{(x+3)(x+2)} + \frac{4(x+12)}{(x+2)(x+3)} = \frac{x^2+7x+12}{(x+3)(x+2)} = \frac{(x+4)(x+3)}{(x+3)(x+2)} = \boxed{\frac{x+4}{x+2}}$

6.  $\frac{x}{x-2} - \frac{2}{x-2} = \frac{x-2}{x-2} = \boxed{1}$

Solve each equation.

7.  $\frac{3}{2m} = \frac{m+1}{4m} \Rightarrow 12m = 2m^2 + 2m$

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

$0 = 2m^2 - 10m$

$0 = 2m(m-5)$

$m=0, m=5$

8.  $\frac{2x(x+2)}{(x+2)(x-1)} - \frac{2}{1} = \frac{10}{(x+2)(x-1)}$

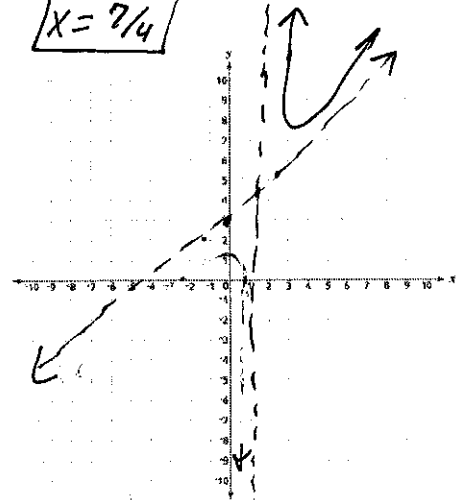
$2x^2 + 4x - 2(x^2 + x - 2) = 10x - 10$

$2x^2 + 4x - 2x^2 - 2x + 4 = 10x - 10$

$2x + 4 = 10x - 10$

$\frac{14}{8} = \frac{8x}{8}$

$x = 7/4$



9. Graph  $y = \frac{x^2 + 2x + 3}{x-1}$

a) coordinate of hole: none

b) y-int: (0, -3)

c) equation of vertical asymptote: x=1

d) zero(s): none

e) equation of horizontal/slant asymptote: y=x+3

$$\begin{array}{r} x+3 \\ x-1 \overline{) x^2 + 2x + 3} \\ \underline{x^2 + x} \phantom{+ 3} \\ 3x + 3 \\ \underline{-3x + 3} \\ 6 \end{array}$$

$x^2 + 2x + 3 = 0$

$a=1, b=2, c=3$

$x = \frac{-2 \pm \sqrt{4 - 4(1)(3)}}{2} = \frac{-2 \pm \sqrt{-8}}{2} = \text{imaginary solutions}$

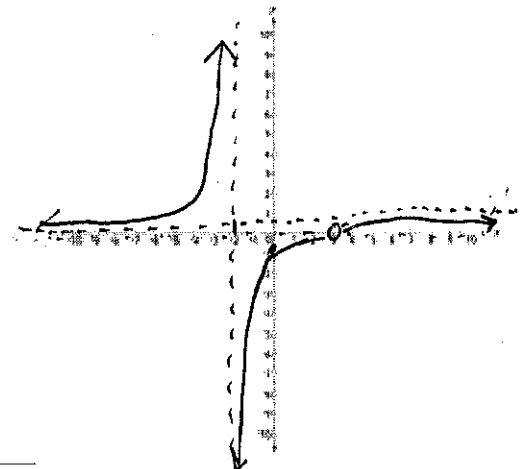
10. Graph  $y = \frac{x^2 - 6x + 9}{2x^2 - 2x - 12} = \frac{(x-3)(x-3)}{2(x-3)(x+2)} = \frac{x-3}{2(x+2)}$

a) coordinate of hole: x=3 (3,0)

b) y-int: (0, -3/4)

c) equation of vertical asymptote: x=-2

d) zero(s): (3,0)



e) equation of horizontal/slant asymptote: y=1/2