

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. ± 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.

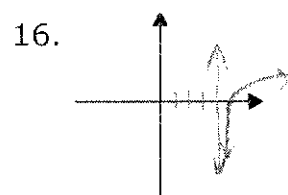
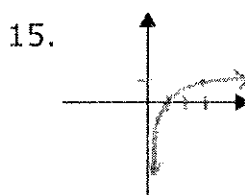
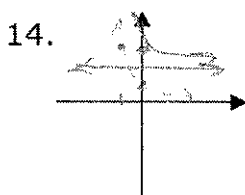
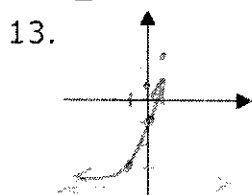
13. $y = 3^{x+1} - 4$ Domain: _____ Range: _____ Asymptote: _____ Intercept: _____
14. $y = \left(\frac{1}{3}\right)^x + 2$ Domain: _____ Range: _____ Asymptote: _____ Intercept: _____
15. $y = \log_3 x$ Domain: _____ Range: _____ Asymptote: _____
16. $y = \log_3(x-4)$ Domain: _____ Range: _____ Asymptote: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

Answers:

1. **Function**
D: $x \in \mathbb{R}$
R: $y \geq 0$
Inverse
D: $x \geq 0$
R: $y \geq -1$

2. **Function**
D: $[-2, 2]$
R: $[1, 9]$
Inverse
D: $[1, 9]$
R: $[-5, 2]$

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

Dom: $x > 0$; Ran: \mathbb{R} Dom: $x > 4$; Ran: \mathbb{R}
Asy: $x = 0$; Int: $(1, 0)$ Asy: $x = 4$; Int: $(5, 0)$

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

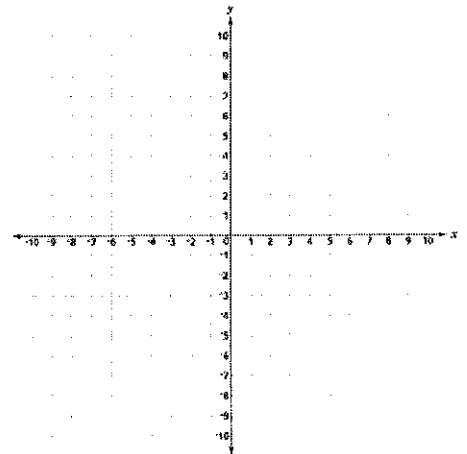
a) coordinate of hole: _____

b) y-int: _____

c) equation of vertical asymptote: _____

d) zero(s): _____

e) equation of horizontal/slant asymptote: _____



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

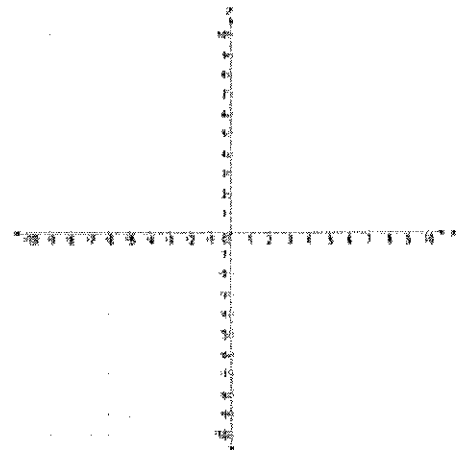
a) coordinate of hole: _____

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

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

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

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

5. $\frac{x^2+3x}{x^2+5x+6} + \frac{4x+12}{(x+2)(x+3)} = \frac{x^2+7x+12}{(x+3)(x+2)} = \frac{(x+4)(x+3)}{\cancel{(x+3)}(x+2)} = \boxed{\frac{x+4}{x+2}}$

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

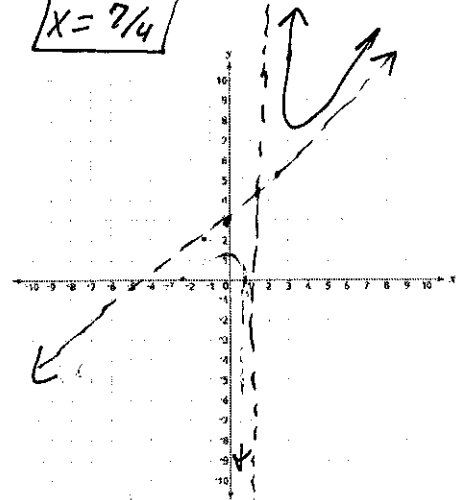
$2x^2 + 4x - 2(x^2 + x - 2) = 10x - 10$

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

$2x + 4 = 10x - 10$

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

$x = 7/4$



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

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

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

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

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

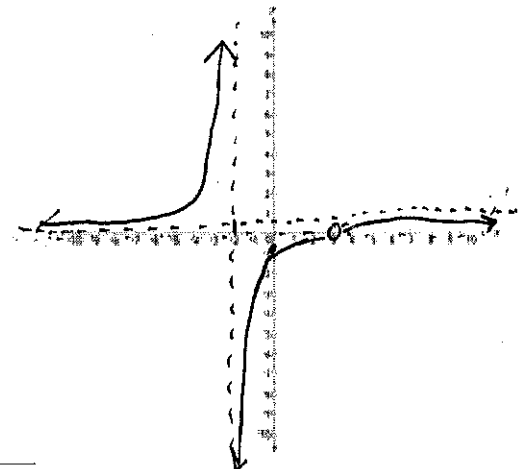
10. Graph $y = \frac{x^2 - 6x + 9}{2x^2 - 2x - 12} = \frac{(x-3)(x-3)}{2(x-3)(x+2)} = \frac{x-3}{2(x+2)}$

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