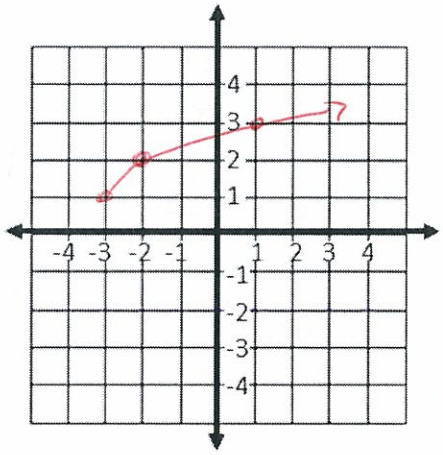
1. Find the domain of the function $f(x)=\sqrt{x+3}+1$ and sketch its graph.



+3
(-1 if not accurate through at least 2 pts

Domain: $[-3,\infty)$ +2
(write as an interval)

$x \geq -3$ accepted

2. Find the equation of a line in slope-intercept form that passes through the points A = (-7,1) and B = (-1,5).

$m = \frac{1-5}{-7-(-1)} = \frac{-4}{-6} = \frac{2}{3}$

$y - y_2 = m(x - x_2)$

$y - 5 = \frac{2}{3}(x+1)$

$y = \frac{2}{3}x + \frac{2}{3} + 5$

$= \frac{2}{3}x + \frac{17}{3}$ +2

$y = mx + b$ +1

3. Given $f(x)=\frac{5}{x^2+1}$ and $g(x)=\sqrt{x^2-9}$, find

a. $(f \circ g)(x)$ simplifying as much as possible

$f \circ g(x) = \frac{5}{(\sqrt{x^2-9})^2+1} = \frac{5}{x^2-9+1} = \frac{5}{x^2-8}$

b. $(g \circ f)(2)$ simplifying as much as possible

$f(2) = \frac{5}{2^2+1} = \frac{5}{5} = 1$

$g(1) = \sqrt{1^2-9} = \sqrt{-8} = 2i\sqrt{2}$

4. Given $f(x)=\frac{2x+3}{x-1}$, find $f^{-1}(x)$.

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

$x \Leftrightarrow y$

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

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

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

$xy-2y=3+x$

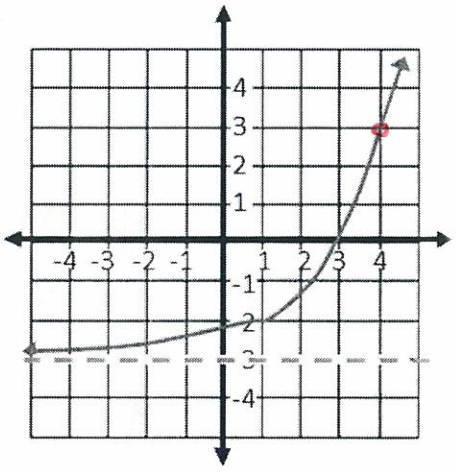
$y(x-2)=3+x$

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

Algebra till end → (+3)

$f^{-1}(x)=\frac{3+x}{x-2}$ (+1)

5. A graph, f(x) is shown below.



Domain of f(x): $(-\infty, \infty)$ (+2)
(state as an interval)

Range of f(x): $(-3, \infty)$ (+1)
(state as an interval)

For what value of x does f(x) = 3? $x=4$ (+2)

6. Completely factor $x^3+7x^2+21x+27$. (Hint: -3 is a root; you may wish to use synthetic or long division)

3	1	7	21	27
		3	12	27
	1	4	9	0

$(x+3)\overline{)x^3+7x^2+21x+27}$

x^2+4x+9

x^3+3x^2

$4x^2$

$4x^2+12x$

$9x$

$9x+27$

0

$(x+3)(x^2+4x+9)$ gets (+1)

$0=x^2+4x+9$ (+2)

$\Rightarrow x=\frac{-4\pm\sqrt{16-4\cdot1\cdot9}}{2}$ (+1)

$=\frac{-4\pm\sqrt{16-36}}{2}$

$=\frac{-4\pm\sqrt{-20}}{2}$

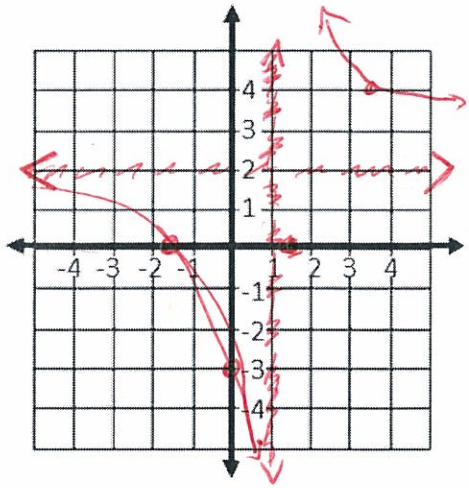
$=\frac{-4\pm2\sqrt{5}}{2}$

$=-2\pm\sqrt{5}$ (+1)

$(x+3)(x+2+\sqrt{5})(x+2+\sqrt{5})$

Answer hard to read. It is:
(x+3)(x+2-i*sqrt(5))(x+2+i*sqrt(5))

7. Graph the function: $f(x)=\frac{2x+3}{x-1}$. Show and label its x-intercept, y-intercept and asymptotes.



x-int: $y=0 \Rightarrow$ $2x+3=0$ $x=-\frac{3}{2}$ $\left(-\frac{3}{2},0\right)$ (+1)

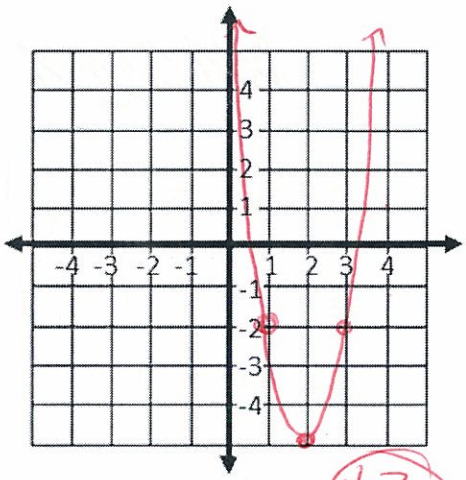
y-int $x=0$ $y=\frac{2(0)+3}{(0)-1}$ $y=-3$ $(0,-3)$ (+1)

gen shape (+1)

vert. asymptote: $x=+1$ (+1)

horiz asymptote: $y=\frac{2}{1}=2$ (+1)

8. Use the "completing the square" method to find write the function, f(x) = $3x^2 - 12x + 7$ in the form $f(x) = a(x-h)^2+k$. Then graph the parabola.



$f(x)=3(x^2-4x\ \ )+7$

$=3(x^2-4x+4)+7-3\cdot4$

$=3(x-2)^2+7-12$

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

(+2)

9. Solve for x

a. $\left(\frac{16}{25}\right)^{-\frac{1}{2}}=x$

$x=\left(\frac{25}{16}\right)^{\frac{1}{2}}$

$=\frac{25^{\frac{1}{2}}}{16^{\frac{1}{2}}}$

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

b. $\log_x \frac{1}{9}=2$

$x^2=\frac{1}{9}$

$x=\sqrt{\frac{1}{9}}$

$x=\frac{1}{3}$ (+2)

10. Solve for x: $(e^x)(e^{3x+2}) = 1$

$e^x \cdot e^{3x+2} = 1$

$\Rightarrow e^{4x+2} = 1$

$\ln(e^{4x+2}) = \ln 1$

$4x + 2 = 0$

$4x = -2$

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

or

$\ln(e^x \cdot e^{3x+2}) = \ln 1$

$\ln(e^x) + \ln(e^{3x+2}) = 0$

$x + 3x + 2 = 0$

$4x + 2 = 0$

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

11. Eliza has just started college. She wants to put some of her gift money in a bank account so that in exactly five years she will have $2500 to spend on a graduation trip. If the account earns 4% interest compounded quarterly, write an expression (simplify, but do not evaluate it) for the amount of money Eliza needs to deposit now, if she is not going to deposit any more money while she is going to school.

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

$\$2500 = P\left(1 + \frac{0.04}{4}\right)^{4 \cdot 5}$

$\$2500 = P(1 + 0.01)^{20}$

$\$2500 = P(1.01)^{20}$

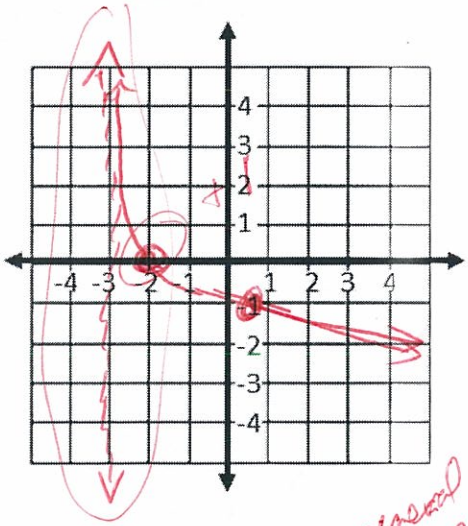
$P = \frac{\$2500}{(1.01)^{20}}$

12. Graph the functions $f(x) = -\ln(x + 3)$ labeling and showing any x-intercepts and any asymptotes.

$\ln x$

$x = -3$

$\ln(x+3)$



general shape +2

13. Solve for x: $\ln(x+1) - \ln(x-2) = \ln(x)$

$\ln\frac{x+1}{x-2} = \ln x$

$e^{\ln\frac{x+1}{x-2}} = e^{\ln x}$

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

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

$x+1 = x^2-2x$

$0 = x^2-3x-1$

$x = \frac{3\pm\sqrt{9+4}}{2}$

$x = \frac{3\pm 13}{2}$

14. Solve the system of equations. Write the answer as a triple, *(x,y,z)*

Answer above missing radical. Should be square root of 13.

$$x + y + z = 3$$
$$x - 2y + 4z = 5$$
$$3y + z = 5$$

$-x - y - z = -3$

$x - 2y + 4z = 5$

$-3y + 3z = 2$ (−Row 1 + Row 2)

$3y + z = 5$

$4z = 7$ (Result + Row 3)

$z = \frac{7}{4}$ (+2)

$3y + \frac{7}{4} = 5$

$3y = \frac{13}{4}$ (+2)

$y = \frac{13}{12}$

$x + \frac{13}{12} + \frac{7}{4} = 3$

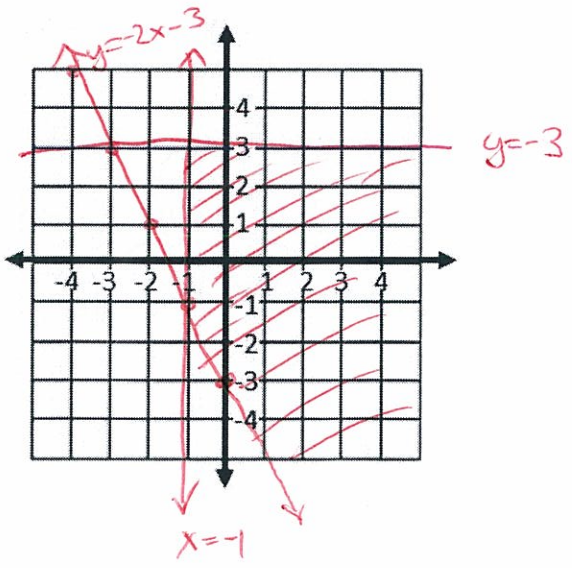
$x = \frac{36}{12} - \frac{13}{12} - \frac{21}{12} = \frac{2}{12} = \frac{1}{6}$

15. Graph the inequalities and indicate the area satisfied by all of them by shading.

$2x + y \geq -3 \rightarrow y \geq -2x - 3$

$y \leq 3$

$x \geq -1$



16. Only two of the following matrices may be multiplied. Write which ones (in the correct order!) and find the

product:

$$A = \begin{bmatrix} -2 & 7 \\ 3 & -3 \\ 0 & 1 \end{bmatrix} \qquad B = \begin{bmatrix} 4 \\ 2 \\ -1 \end{bmatrix} \qquad C = \begin{bmatrix} 2 & -5 \\ 6 & 0 \end{bmatrix}$$

(+2) AC works! (No others)

$$\begin{bmatrix} -2 & 7 \\ 3 & -3 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 2 & -5 \\ 6 & 0 \end{bmatrix} = \begin{bmatrix} -4+42 & 10+0 \\ 6-18 & -15+0 \\ 0+6 & 0+0 \end{bmatrix} = \begin{bmatrix} 38 & 10 \\ -12 & -15 \\ 6 & 0 \end{bmatrix}$$

(+3)

17. Let $A = \begin{bmatrix} -3 & 8 \\ -6 & 10 \end{bmatrix}$. Find det A. Does A have an inverse? If yes, find it. If no, explain why not.

$\det A = -3 \cdot 10 - 8(-6)$

$= -30 + 48$

$= 18$ (+2)

Yes, since $\det A \neq 0$, A has an inverse. (+1)

(+1)

$A^{-1} = \frac{1}{18}\begin{bmatrix} 10 & -8 \\ 6 & -3 \end{bmatrix}$

$= \begin{bmatrix} \frac{5}{9} & -\frac{4}{9} \\ \frac{1}{3} & -\frac{1}{6} \end{bmatrix}$ (+1)

Reduce!

18. On Sunday, you receive seven cards. On Monday, you receive eleven cards. On Tuesday you receive fifteen cards. If the pattern continues every day, how many cards do you receive on the *50th* day? If you save all the cards, how many cards will you have in total on the *50th* day?

S M T

7 11 15

+4 +4

$a_1 = 7$

$d = 4$

(+2)

$a_n = 7 + (n-1) \cdot 4$

$= 7 + 4n - 4$

$= 3 + 4n$

$a_{50} = 3 + 4 \cdot 50$

$= 203$ (+1)

Sun:

$S_{50} = \frac{50}{2}(7 + 203$

$= 25 \cdot 210$

$= 5250$

+

19. Find the first three terms of the sequence: ____, ____, ____, 9, 27, 81, 243,... . Write an expression for the nineteenth terms of this sequence (you do not need to evaluate it).

$\frac{1}{3}, 1, 3, 9, 27, 81$ (+3)

·3 ·3

$a_{19} = a_1 \cdot r^{n-1}$ (+1)

$= \frac{1}{3} \cdot 3^{19-1} = \frac{1}{3} \cdot 3^{18} = 3^{17}$ (+1)

20. Find the sum:

$$\sum_{i=1}^{4} (-2)^i$$

$= (-2)^1 + (-2)^2 + (-2)^3 + (-2)^4$ (+2)

$= -2 + 4 + -8 + 16$ (+2)

$= 10$ (+1)

or (+2) $= -2\frac{(1-(-2)^4)}{(1-(-2))} = -2\frac{(1-16)}{(3)} = -2 \cdot \frac{-15}{3} = 10$ (+1)

21. Use the binomial theorem or Pascal's triangle to expand and simplify the expression: $(x+y)^6$.

$x^6 + 6x^5y + 15x^4y^2 + 20x^3y^3 + 15x^2y^4 + 6xy^5 + y^6$

(+1) correct coefficients

(+2) correct exponents.

(+2) for triangle or work for binomial theorem

1 0th
1 1 1st
1 2 1 2nd
1 3 3 1 3rd
1 4 6 4 1 4th
1 5 10 10 5 1 5th
1 6 15 20 15 6 1 6th

$\frac{1}{6} + \frac{13}{12} + \frac{7}{4}$

$\frac{2}{12} + \frac{13}{12} + \frac{21}{12}$

$= \frac{36}{12}$ ✓

$\frac{1}{6} - 2 \cdot \frac{13}{12} + 4 \cdot \frac{7}{4}$

$\frac{1}{6} - \frac{13}{6} + 7$ ✓