1) (4 points each) Find the domain of the following functions

a) $f(x)=\dfrac{5x+7}{x^2-4}$

$x^2-4=0$

$x^2=4$

$x \neq \pm 2$

b) $g(x)=\sqrt{2x-7}$

$2x-7 \geq 0$

$x \geq 7/2$

2) (3 points each) For the function $f(x)=x^2+5x-3$, find…

a) $f(-1)$

$=(-1)^2+5(-1)-3$

$=\boxed{-7}$

b) $f(x+h)$

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

$=\boxed{x^2+2xh+h^2+5x+5h-3}$

3) (4 points each) For the quadratic function $f(x)=x^2-2x-8$, find…

a) The vertex:

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

$f(1)=-9$

$(1,-9)$

b) The intercepts (label answers):

x-int

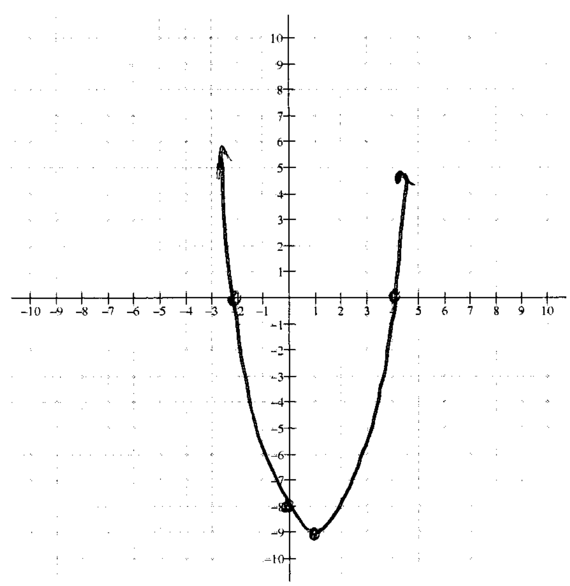
$(x-4)(x+2)=0$

$x=4,-2$

y-int

$y=-8$

c) Sketch the graph using the above:

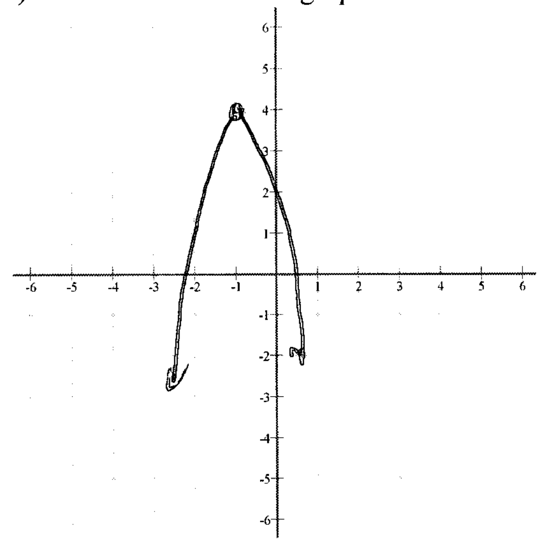


4) (3 points each) For the function $f(x) = -2(x+1)^2 + 4\ldots$

a) Explain, in order, the steps needed to sketch the graph:

1) Left 1
2) multiply y-coordinates by -2
3) up 4

b) Sketch and label the graph:



5) (4 points each) For the function $f(x) = \dfrac{2x+2}{x^2-1}$, find...

a) The domain:

$x^2 - 1 = 0$

$x \neq \pm 1$

b) The intercepts (if any):

x-int

$2x+2=0$

$x=-1$

$\emptyset$

y-int

$f(0)=-2$

$(0,-2)$

c) Any vertical asymptotes and holes:

$x=1$ $2(1)+2 \neq 0$ $x=1$ VA

$x=-1$ $2(-1)+2=0$ Hole

$\dfrac{2(x+1)}{(x+1)(x-1)} = \dfrac{2}{x-1}$ @ $x=-1$ $\dfrac{2}{-1-1} = -1$

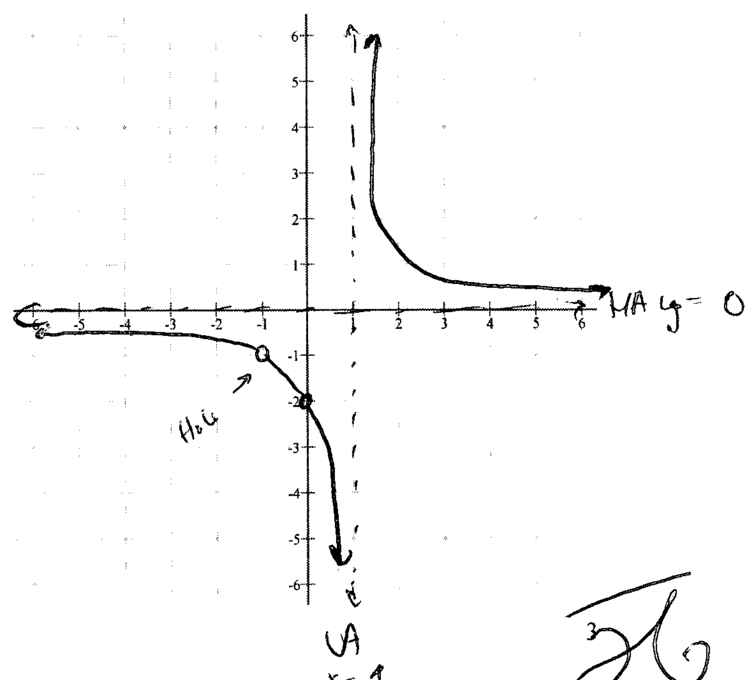
$(-1,-1)$

d) Any horizontal or ~~oblique~~ asymptotes:

HA

$y=0$

e) Sketch a graph using the above information.
HINT: Consider transformations based on the simplified version of the function!



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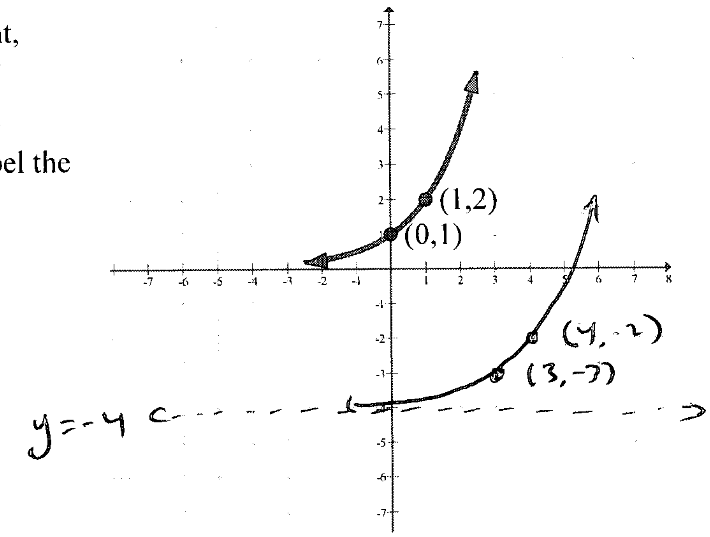
6) (6 points) Given the graph of $y = 2^x$ to the right, write the steps necessary to sketch the graph of $f(x) = 2^{x-3} - 4$ using transformations and then sketch the graph of the function. Be sure to label the transformed points and asymptote:

1) Right 3
2) Down 4



7) (3 points) Write the expression as one logarithm: $5\log x + 9\log y - \frac{1}{3}\log z$

$= \log x^5 + \log y^9 - \log z^{1/3} = \log \frac{x^5 y^9}{z^{1/3}}$

8) (6 points each) Solve for the variable. Be sure to find the exact value.

a) $2^{2x-1} = 16^{x+4}$

$2^{2x-1} = (2^4)^{x+4}$

$2^{2x-1} = 2^{4x+16}$

$2x - 1 = 4x + 16$

$-17 = 2x \Rightarrow x = -\frac{17}{2}$

b) $10e^{4x+1} = 13$

$e^{4x+1} = \frac{13}{10}$

$\ln\frac{13}{10} = 4x + 1$

$\frac{\ln\frac{13}{10} - 1}{4} = x$

c) $\log_2(x+1) - \log_2(x+2) = \log_2 8$

$\log_2 \frac{x+1}{x+2} = \log_2 8$

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

$x + 1 = 8x + 16$

$-15 = 7x$

$x = -\frac{15}{7}$ $\varnothing$

d) $\ln(3x+4) + 3 = 12$

$\ln(3x+4) = 9$

$e^9 = 3x + 4$

$\frac{e^9 - 4}{3} = x$

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9) The video "My Cat Powers Up His Attacks" started to go viral last year. At 8 am, when the video was posted, there were 300 views. At noon, there 12,000 views. Assume that the number of views is growing exponential and use the formula $P(t) = P_0 e^{kt}$ where P is the number of views and t is the number of hours past 8 am.

a) (6 points) Determine the exact value for the growth rate k.

$12000 = 300\, e^{4k}$

$40 = e^{4k}$

$\ln 40 = 4k$

$k = \frac{\ln 40}{4}$

b) Extra Credit (2 points): Determine the exact time in hour:minute:second format when there was 60,000 views.

$60000 = 300\, e^{\frac{\ln 40}{4} t}$

$200 = e^{\frac{\ln 40}{4} t}$

$\ln 200 = \frac{\ln 40}{4} t$

$t = \frac{\ln 200}{\frac{\ln 40}{4}} \approx \boxed{5}.745178103\ldots$

$\times 60$ 44.7106862

$\times 60$

5hrs 44min 42.6sec

10) (1 measly point) Fill in the blank: John Jacob Jingleheimer Schmidt, a foreign exchange student from Norway, is in your math class. (Yes, in the future, you'll be teaching math—kudos: me.) He asks one day for you to pronounce $\log_4 12$ for him. You reply "Gladly, it's pronounced Logarithm base 4 of 12"

11) (2 points) Short answer: Why are logarithms necessary?

cuz

12) (3 points each) Clearly explain how to find the following algebraically:

a) Vertical Asymptotes and Holes:

Bo ba doooo

b) Horizontal and Oblique Asymptotes:

Shooo baaa dooo

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