1) (3 points each) Let $f(x)=\sqrt{x+5}$ and $g(x)=x^2+1$. Find...

a) $(f+g)(x)$

$=\sqrt{x+5}+x^2+1$

b) $(f-g)(4)$

$=f(4)-g(4)$

$=3-17=-14$

c) $(f\circ g)(x)$

$=\sqrt{x^2+1+5}$

$=\sqrt{x^2+6}$

d) $(f\circ g)(3)$

$=\sqrt{3^2+6}$

$=\sqrt{15}$

2) (3 points) Find two functions, f and g, such that $f\circ g=h$ where $h(x)=\sqrt[5]{2x^2+7}$:

$f(x)=\sqrt[5]{x}$

$g(x)=2x^2+7$

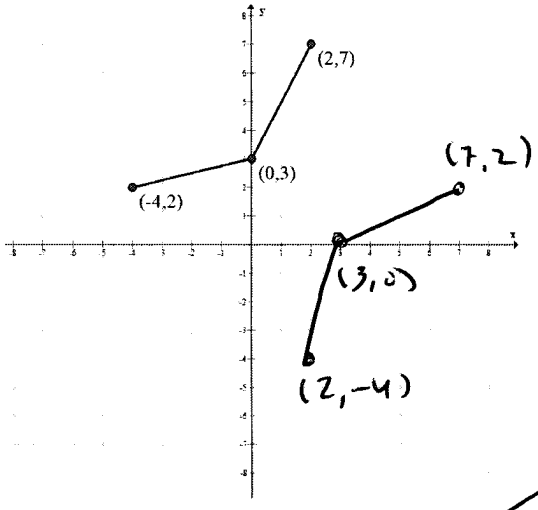
multiple answer

3) (3 points each) For the following one-to-one functions, find the inverse. For part b, draw the inverse on the graph:

a) $\{(8,6),(3,-2),(0,7),(5,2)\}$

$\{(6,8),(-2,3),(7,0),(2,5)\}$

b)



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4) (5 points each) For the function $f(x)=2x^5-1$, find (showing all necessary work)...

a) $f^{-1}(x)$

① $y=2x^5-1$

② $x=2y^5-1$

③ $x+1=2y^5$

$\frac{x+1}{2}=y^5$

$\sqrt[5]{\frac{x+1}{2}}=y$

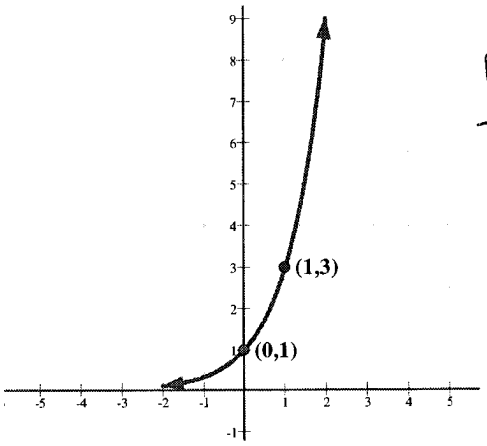
④ $f^{-1}(x)=\sqrt[5]{\frac{x+1}{2}}$

b) $(f\circ f^{-1})(x)$ $=2\left(\sqrt[5]{\frac{x+1}{2}}\right)^5-1$

$=2\left(\frac{x+1}{2}\right)-1$

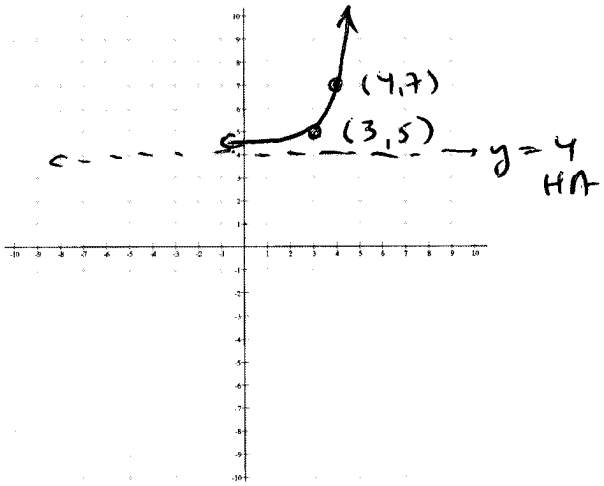
$=x+1-1=x$

5) (5 points) Graph $g(x)=3^{x-3}+4$ by transforming the given function $y=3^x$. Be sure to move and label the given points and asymptote.



1) Right 3

2) up 4



6) (3 points each) Write as a logarithmic equation:

a) $81^{\frac{1}{4}}=3$

$\log_{81}3=\frac{1}{4}$

b) $e^x=2$

$\ln 2=x$

7) (3 points each) Write as an exponential equation.

a) $\log_2 32=5$

$2^5=32$

b) $\log 1000=3$

$10^3=1000$

8) (2 points each) Simplify without a calculator:

a) $\log_9 81$ b) $\log_{16} 2$ c) $\log_5 \sqrt[4]{5}$ d) $\ln e^{-4}$

2 $\frac{1}{4}$ $\frac{1}{4}$ -4

9) (3 points) Fill in the blank: Jo Jo Ba decides to put away her javelins and take up teaching math. One day, she writes on the board $\ln 46 - \log_3 4$ and says "Class, this is correctly pronounced queste non è la risposta"

10) (5 points) Write $8\log_3 x + 3\log_3 y - 10\log_3 z$ as one logarithm:

$= \log_3 x^8 + \log_3 y^3 - \log_3 z^{10}$

$= \log_3 (x^8 y^3) - \log_3 z^{10} = \log_3 \left(\frac{x^8 y^3}{z^{10}}\right)$

11) (6 points) Given that $\ln x = -3$, $\ln y = 8$, and $\ln z = 2$, find the exact value for $\ln\left(\frac{x^3 y}{z^3}\right)$:

$\ln \frac{x^3 y}{z^3} = \ln x^3 y - \ln z^3 = \ln x^3 + \ln y - \ln z^3$

$= 3\ln x + \ln y - 3\ln z$

$= 3(-3) + 8 - 3(2) = -7$

12) (6 points each) Solve for the variable. Find the exact value (no decimals):

a) $4^{3x+2} = 64$

$4^{3x+2} = 4^3$

$3x + 2 = 3$

$x = -1/3$

b) $12^{x-3} = 4$

$\log_{12} 4 = x - 3$

$x = \log_{12} 4 + 3$

$= \frac{\log 4}{\log 12} + 3$

13) (6 points each) Solve for the variable. Find the exact value (no decimals):

a) $\log_5(5x-1)=\log_5(2x+6)$

$5x-1=2x+6$

$3x=7$

$x=7/3$

b) $\log_2(2x+1)-\log_2(x-5)=3$

$\log_2 \frac{2x+1}{x-5}=3$

$\frac{2x+1}{x-5}=2^3=8$

$2x+1=8x-40$

$41=6x$

$x=\frac{41}{6}$

14) (6 points each) Suppose that \$5,000 was deposited into an account that offers a 3.75% annual interest compounded continuously. How long will it take for the account to reach \$8,000? Use the formula $A=Pe^{rt}$.

$8000=5000e^{.0375t}$

$\frac{8}{5}=e^{.0375t}$

$\ln\frac{8}{5}=.0375t$

$t=\frac{\ln 8/5}{.0375}$

≈ 12.53 years

Extra Credit: (1 point each) Fill in the blank:

a) $\log_b x=y$ implies _____

b) $\log_b(MN)=$_____

c) $\log_b \frac{M}{N}=$_____

d) $p\cdot\log_b M=$_____

e) $b^{\log_b M}=$_____

f) $\log_b b^M=$_____

g) $\log_b 1=$_____

h) $\log_b b=$_____

i) $b^M=b^N$ implies _____

j) $\log_b M=\log_b N$ implies _____

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