1. (5pts) The table gives values of f and g for some x's. Find the following:

$$f^{-1}(3) = 2 \qquad \text{(need } x \text{ so that } f(x) = 3, \; x = 2)$$

x	1	2	3	4
$f(x)$	1	3	4	2
$g(x)$	4	3	1	2

$$g^{-1}(2) = 4$$

$$(f \circ g^{-1})(1) = f(g^{-1}(1)) = f(3) = 4$$

$$(g^{-1} \circ f^{-1})(3) = g^{-1}(f^{-1}(3)) = g^{-1}(2) = 4$$

2. (4pts) The graph of a function f is given. Use it to find the graph of f^{-1}, labeling the relevant points.
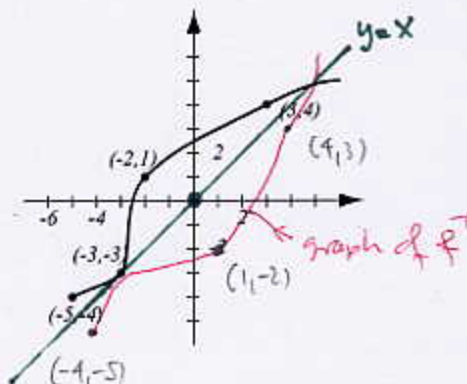
3. (5pts) Let $f(x) = \dfrac{4x}{3x - 2}$.
a) Find $f^{-1}(x)$.
b) Find the domain and range of f^{-1}.

$$y = \frac{4x}{3x-2}$$

$$(3x-2)\, y = 4x$$

$$3xy - 2y = 4x$$

$$-2y = 4x - 3xy$$

$$-2y = x(4 - 3y)$$

$$x = \frac{-2y}{4-3y} = \frac{2y}{3y-4}$$

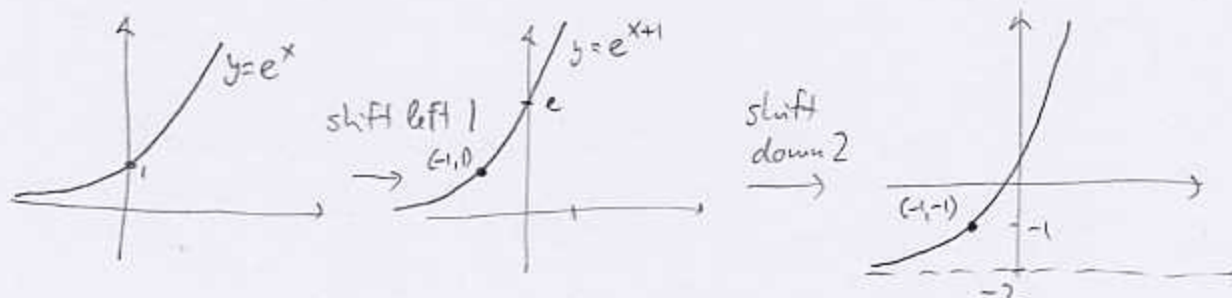b) Domain of f^{-1}: $3y - 4 = 0$

$$y = \frac{4}{3}$$

$$D = \left\{ y \mid y \neq \tfrac{4}{3} \right\}$$

c) Range of f^{-1} = Domain of $f = \left\{ x \mid x \neq \tfrac{2}{3} \right\}$

$$3x - 2 = 0$$

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

4. (4pts) Use the basic graph of $y = e^x$ and transformations to help you sketch the graph of $y = e^{x+1} - 2$. Explain how you transform the original graph. Find all the asymptotes of $y = e^{x+1} - 2$.


shift left 1 $\xrightarrow{(-1,0)}$ shift down 2 $\xrightarrow{(-1,-1)}$

Horizontal asymptote: $y = -2$

5. (4pts) The atmospheric pressure at a point h kilometers above sea level is given by $P(h) = 760e^{-0.145h}$ (pressure is measured in millimeters of mercury).
a) What is the pressure at height 4km?
b) At what height is pressure 700? (Use graphing on your calculator to find the solution of the appropriate equation).

a) $P(4) = 760e^{-0.145 \cdot 4}$

$= 425.52$

b)
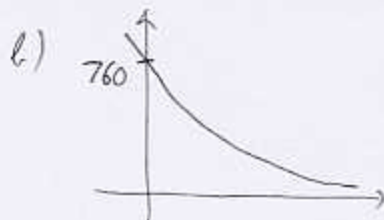
Trace until you get $y = 700$
approx $x \approx 0.59$

6. (8pts) Solve the equations:

$5^{x^2+4x-19} = 25$

$5^{x^2+4x-19} = 5^2$

$x^2 + 4x - 19 = 2$

$x^2 + 4x - 21 = 0$

$(x+7)(x-3) = 0$

$x = -7, 3$

$2^{3x+7} = 16^{2x+1}$

$2^{3x+7} = (2^4)^{2x+1}$

$2^{3x+7} = 2^{8x+4}$

$3x + 7 = 8x + 4$

$3 = 5x$

$x = \dfrac{3}{5}$