**Fall '07/MAT 150/Worksheet 6** **Name:** Solution *Show all your work.*

**1.** (4pts) The table below indicates the values of $f(x)$ and $g(x)$ for certain numbers. Find the requested composites at right.

| x | -3 | -1 | 1 | 3 | 5 |
|---|---|---|---|---|---|
| f(x) | -1 | 5 | 3 | 7 | -3 |
| g(x) | 3 | -3 | 5 | -1 | 1 |

$(f \circ g)(1) =$ $f(g(1)) = f(5) = -3$

$(g \circ f)(5) =$ $g(f(5)) = g(-3) = 3$

$(f \circ f)(3) =$ $f(f(3)) = f(7)$ not defined

$(g \circ g)(-1) =$ $g(g(-1)) = g(-3) = 3$

**2.** (8pts) Let $f(x) = x^2 - 5x + 2$ and $g(x) = \sqrt{x-5}$. Find the following composites and simplify where possible:

$(f \circ g)(x) =$ $f(g(x)) = f(\sqrt{x-5}) = (\sqrt{x-5})^2 - 5\sqrt{x-5} + 2 = x - 5\sqrt{x-5} - 3$ ($\sqrt{x-5}$ ↓ $x-5$)

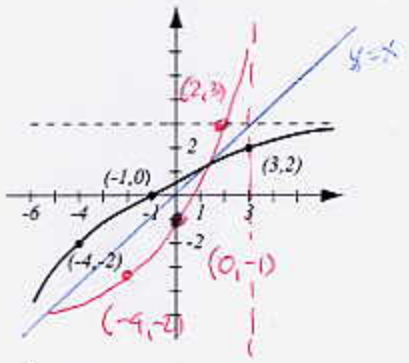
$(g \circ f)(x) =$ $g(f(x)) = g(x^2 - 5x + 2) = \sqrt{x^2 - 5x + 2 - 5} = \sqrt{x^2 - 5x - 3}$

$(g \circ g)(x) =$ $g(g(x)) = g(\sqrt{x-5}) = \sqrt{\sqrt{x-5} - 5}$

**3.** (4pts) Find functions $f$ and $g$ so that $f \circ g = H$, if $H(x) = (x-3)^2$. Find two different solutions to this problem, neither of which is the "stupid" one.

$g(x) = x - 3$ $f(x) = x^2$ or $g(x) = x - 1$ $f(x) = (x-2)^2$ or $H(x) = x^2 - 6x + 9$ $g(x) = x^2 - 6x$ $f(x) = x + 9$

**4.** (5pts) The graph of a function $f$ is given. Use it to find the graph of $f^{-1}$, labeling the relevant points and showing its asymptote.




Reflect over line $y=x$

$f^{-1}$ has vertical asymptote $x=3$

**5.** (5pts) Find the inverse of $g(x) = \dfrac{3x-1}{4x+7}$ and the range of $g$.

$y = \dfrac{3x-1}{4x+7}$ $\quad | \cdot (4x+7)$

$(4x+7)y = 3x-1$

$4xy+7y = 3x-1 \quad | -7y, -3x$

$4xy-3x = -7y-1$

$x(4y-3) = -7y-1 \quad | \div (4y-3)$

$x = \dfrac{-7y-1}{4y-3} = \dfrac{7y+1}{3-4y}$

Range of $g$ = domain of $g^{-1}$

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

$3-4y=0$

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

**6.** (4pts) Use the basic graph of $y = e^x$ and transformations to help you sketch the graph of $y = 3 - e^x$. Explain how you transform the original graph and what the asymptote of the new graph is.