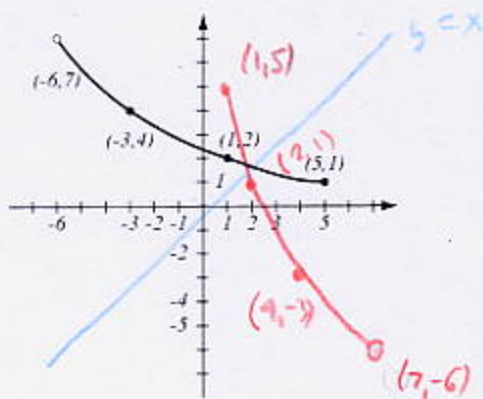**1.** (6pts) The graph of a function $f$ is given.
a) Is this function one-to-one? Justify.
b) If the function is one-to-one, find the graph of $f^{-1}$, labeling the relevant points.

a) Yes - it passes the horizontal line test

**2.** (12pts) Let $g(x) = \dfrac{3x+4}{4x+5}$. Find the formula for $g^{-1}$. Find the domain and range of $g$.

$y = \dfrac{3x+4}{4x+5} \quad \Big| \cdot (4x+5)$

$(4x+5)y = 3x+4$

$4xy + 5y = 3x+4 \quad \Big| -5y -3x$

$4xy - 3x = 4 - 5y$

$x(4y-3) = 4 - 5y$

$x = \dfrac{4-5y}{4y-3} \qquad g^{-1}(y) = \dfrac{4-5y}{4y-3}$

Domain of $g$: $4x+5=0$ (can't have)
$\qquad x = -\frac{5}{4}$

$\left(-\infty, -\frac{5}{4}\right) \cup \left(-\frac{5}{4}, \infty\right)$

Domain of $g^{-1}$: can't have $4y-3=0$
$\qquad y = \frac{3}{4}$
= range of $g$

$\left(-\infty, \frac{3}{4}\right) \cup \left(\frac{3}{4}, \infty\right)$

**3.** (8pts) Evaluate without using the calculator:

$\log_3 729 = 6 \qquad \log_5 \frac{1}{125} = -3 \qquad \log_{16} 2 = \frac{1}{4} \qquad \log_c \sqrt[5]{c^2} = \frac{2}{5}$

$3^? = 729 \qquad\quad 5^? = 125 \qquad\quad 16^? = 2 \qquad\quad c^? = \sqrt[5]{c^2} = c^{\frac{2}{5}}$

**4.** (4pts) Use your calculator to find $\log_7 78$ with accuracy 6 decimal places. Show how you obtained your number.

$\log_7 78 = \dfrac{\log 78}{\log 7} = 2.238905$

$\left(\text{or, may do } \dfrac{\ln 78}{\ln 7}\right)$

**5.** (6pts) If you invest \$20,000 in an account bearing 4.25%, compounded quarterly, how much is in the account in 5 years?

$$A = P\left(1 + \frac{r}{u}\right)^{ut} \qquad A = 20000\left(1 + \frac{0.0425}{4}\right)^{4 \cdot 5} = 20000 \cdot 1.010625^{20} =$$

$$= 20,000 \cdot 1.2353.. = 24,707.61$$

**6.** (3pts) Find the domain of $f(x) = \log_{17}(7 - 2x)$.

Must have: $\quad 7 - 2x > 0 \qquad\qquad x < \frac{7}{2}$

$$7 > 2x$$

$$\frac{7}{2} > x \qquad\qquad \text{Domain} \; \left(-\infty, \frac{7}{2}\right)$$

**7.** (7pts) The number of master's degrees (in thousands) earned by women is modeled by the function $D(t) = 43.1224(1.0475)^t$, where $t$ is the number of years since 1960.
a) Find the number of master's degrees earned by women in 2004. How many master's degrees will be earned in 2020, according to the model?
b) Use the intersect feature on the calculator to estimate in what year the number of master's degrees will surpass 200,000.

a) 2004 is 44 years since 1960
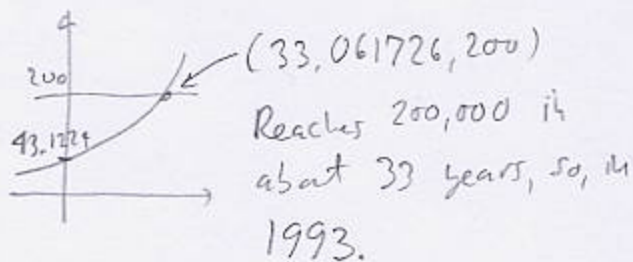
2020 is 60 years since 1960

$$D(44) = 43.1224 \cdot 1.0475^{44} = 332.261725$$

about 332,262 degrees in 2004

$$D(60) = 43.1224 \cdot 1.0475^{60} = 698.143698$$

about 698,144 degrees in 2020

b) Solve $43.1224 \cdot 1.0475^t = 200$

$(33.061726, 200)$

Reaches 200,000 in about 33 years, so, in 1993.

**8.** (14pts) Using transformations, draw the graphs of $f(x) = 4 \cdot 3^{x-5}$ and $g(x) = 2 - \log(x+3)$. Explain how you transform graphs of basic functions in order to get the graphs of $f$ and $g$.

$y = 3^x$ — $(0,1)$ → shift right 5 → $y = 3^{x-5}$, $(5,1)$ → stretch vertically, factor 4 → $y = 4 \cdot 3^{x-5}$, $(5,4)$

$y = \log_3 x$, $(1,0)$ → shift left 3 → $y = \log_3(x+3)$, $x=-3$, $(-2,0)$ → reflect in x-axis → $y = -\log_3(x+3)$, $(-2,0)$ → $y = -\log_3(x+3) + 2$, $(-2,2)$