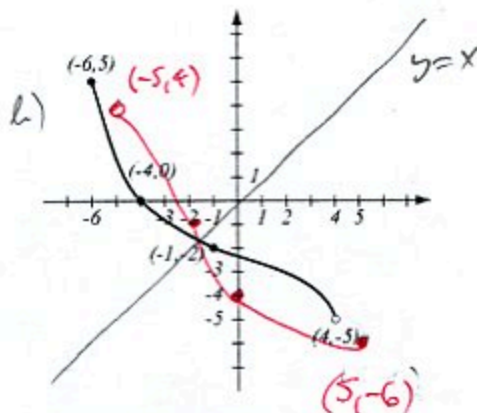


1. (6pts) The graph of a function f is given.

- 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 $f(x) = \frac{2x-1}{3x+7}$. Find the formula for f^{-1} . Find the domain and range of f .

$$y = \frac{2x-1}{3x+7}$$

Domain of f : can't have $3x+7=0$
 $3x = -7$
 $x = -\frac{7}{3}$

$$y(3x+7) = 2x-1$$

$$D = (-\infty, -\frac{7}{3}) \cup (-\frac{7}{3}, \infty)$$

$$3yx+7y = 2x-1$$

Range of $f =$ Domain of f^{-1}

$$3yx - 2x = -7y - 1$$

can't have $2-3y=0$

$$x(3y-2) = -7y-1$$

$$R = (-\infty, \frac{2}{3}) \cup (\frac{2}{3}, \infty)$$

$$x = \frac{-7y-1}{3y-2} = \frac{7y+1}{2-3y}$$

$$f^{-1}(y) = \frac{7y+1}{2-3y}$$

$$2 = 3y$$

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

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

$$\log_2 128 = 7$$

$$\log_4 \frac{1}{64} = -3$$

$$\log_{25} 125 = \frac{3}{2}$$

$$\log_6 \sqrt[3]{6^3} = \frac{3}{7}$$

$$2^? = 128$$

$$4^? = \frac{1}{64} = \frac{1}{4^3} = 4^{-3}$$

$$25^? = 125$$

$$b^? = \sqrt[3]{b^3} = b^{\frac{3}{7}}$$

$$(5^2)^? = 5^3$$

4. (4pts) Use your calculator to find $\log_{12} 0.5$ with accuracy 6 decimal places. Show how you obtained your number.

$$\log_{12} 0.5 = \frac{\ln 0.5}{\ln 12} = -0.278943$$

5. (6pts) If you invest \$3,000 in an account bearing 3.33%, compounded monthly, how much is in the account in 42 months?

$$A = P\left(1 + \frac{r}{n}\right)^{nt} = 3000\left(1 + \frac{0.0333}{12}\right)^{12 \cdot \frac{42}{12}} = 3000\left(1 + \frac{0.0333}{12}\right)^{42} = 3370.30$$

$42 \text{ mo} = \frac{42}{12} \text{ years}$

6. (3pts) Find the domain of $f(x) = \log_9(3x - 1)$.

Must have $3x - 1 > 0$
 $3x > 1$
 $x > \frac{1}{3}$

domain = $\left(\frac{1}{3}, \infty\right)$

7. (7pts) The cost per household for taking the US census is modeled by the function $C(t) = 15.5202(1.0508)^t$, where t is the number of years since 1970.

- a) Find the per-household census cost in 1990. According to the model, what will be the per-household cost in 2020?
 b) Use the intersect feature on the calculator to estimate in what year the per-household cost will go past \$200.

a) $C(20) = 15.5202 \cdot 1.0508^{20} = 41.81$
 $C(50) = 15.5202 \cdot 1.0508^{50} = 184.88$

b) Solve $15.5202 \cdot 1.0508^t = 200$

intersect gives $t = 51.585937$, thus about 52 years since 1970
 Approximately in 2022.

8. (14pts) Using transformations, draw the graphs of $f(x) = 3 - 2^{-x}$ and $g(x) = \frac{1}{2} \log(x - 5)$. Explain how you transform graphs of basic functions in order to get the graphs of f and g .

