College Algebra — Joysheet 10
MAT 140, Spring 2025 — D. Ivanšić

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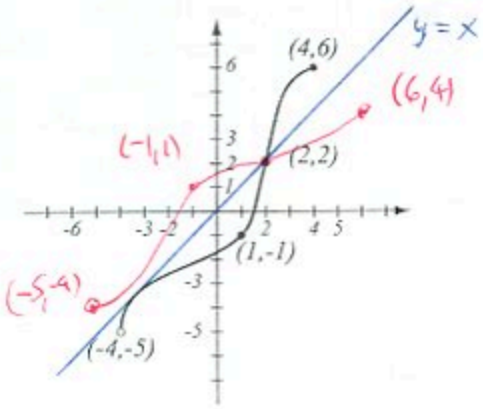
Covers: 5.1–5.3 *Show all your work!*

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 $f(x) = \dfrac{2x+1}{x-7}$. Find the formula for f^{-1}. Find the ranges of f and f^{-1}.

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

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

$yx - 7y = 2x+1 \quad |-2x+7y$

$yx - 2x = 7y+1$

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

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

Range f = domain f^{-1} — ~~0~~ 2

Can't have $y-2=0$, $y=2$ — $(-\infty, 2) \cup (2, \infty)$

Range f^{-1} = domain f — ~~0~~ 7

Can't have $x-7=0$, $x=7$ — $(-\infty, 7) \cup (7, \infty)$

3. (8pts) Evaluate without using the calculator. For each problem, write the question you should ask yourself in order to find the logarithms.

$\log_8 64 = 2$ — $8^? = 64$

$\log_5 \frac{1}{125} = -3$ — $5^? = \frac{1}{125} = \frac{1}{5^3} = 5^{-3}$

$\log_3 \sqrt[4]{9} = \frac{1}{2}$ — $3^? = \sqrt[4]{9} = \sqrt[4]{3^2} = 3^{\frac{2}{4}} = 3^{\frac{1}{2}}$

$\log_{a^2} a = \frac{1}{2}$ — $(a^2)^? = a = a^1 = a^{2 \cdot \frac{1}{2}} = (a^2)^{\frac{1}{2}}$

4. (4pts) Use the change-of-base formula and your calculator to find $\log_4 15$ with accuracy 6 decimal places. Show how you obtained your number.

$\log_4 15 = \dfrac{\ln 15}{\ln 4} = 1.953445$

5. (12pts) Investigate the effect of increased frequency of compounding: for a deposit of \$2,500 and annual interest rate of 3.96%, calculate the amount in the account after 1 year for the frequencies of compounding below.
a) Write the general formula for the amount, replacing the variables by numbers, if known.
b) Use the table feature on your calculator to quickly compute amounts after 1 year.
c) Does compounding more often make a big difference?

$A = 2500\left(1 + \frac{0.0396}{n}\right)^{n \cdot 1}$

Frequency: every	n	Amount after 1 year
year	1	2599
quarter	4	2600.48
month	12	2660.81
day	365	2600.98
hour	365·24	2600.98
second	365·24·3600	2600.99

c) It does not make much of a difference

6. (3pts) Find the domain of $f(x) = \ln(2x - 9)$. Write your solution in interval notation.

Must have $2x - 9 > 0$, $2x > 9$, $x > \frac{9}{2}$

$(\frac{9}{2}, \infty)$

7. (8pts) A home's monthly electricity cost is given by the formula $C(x) = 35.49 + 0.13x$, where x is the number of kilowatt-hours (kWh) used in a month.
a) Determine the monhly cost if 956 kWh and 1,291 kWh are used.
b) Find a formula for the inverse function and explain what it represents.
c) How many kWh were used if the monthly bills were \$198.38 and \$133.64?

a) $C(956) = 35.49 + 0.13 \cdot 956 = \$159.77$
$C(1291) = 35.49 + 0.13 \cdot 1291 = \$203.32$

b) $C = 35.49 + 0.13x$ solve for x
$C - 35.49 = 0.13x$
$x = \frac{C - 35.49}{0.13}$ Gives number of kWh used if bill was a given number C

c) $x = \frac{198.38 - 35.49}{0.13} = 1253$ kWh
$x = \frac{133.64 - 35.49}{0.13} = 755$ kWh

8. (7pts) Using transformations, draw the graph of $f(x) = -\ln(x - 4)$. Explain how you transform the graph of a basic function in order to get the graph of f. Show at least one point on the graph, and asymptotes to the graph, if any.