College Algebra — Joysheet 8 MAT 140, Fall 2016 — D. Ivanšić

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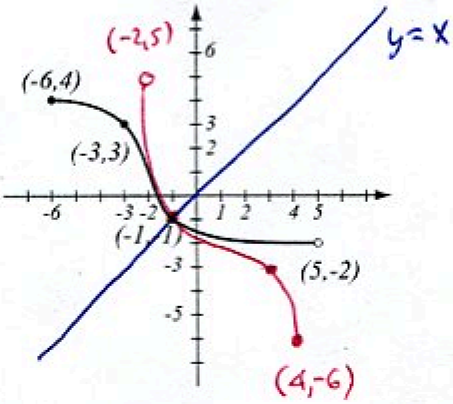
Covers: 5.1–5.3 *Show all your work!*

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

b) Reflect graph in line $y=x$

2. (12pts) Let $f(x) = \dfrac{3x+2}{x-5}$. Find the formula for f^{-1}. Find the ranges of f and f^{-1}.

$y = \dfrac{3x+2}{x-5}$ solve for x

$(x-5)y = 3x+2$

$yx - 5y = 3x + 2 \quad | +5y - 3x$

$yx - 3x = 5y + 2$

$x(y-3) = 5y+2$

$x = \dfrac{5y+2}{y-3}$

$f^{-1}(y) = \dfrac{5y+2}{y-3}$

Range of f = Domain of $f^{-1} = \{y \mid y \neq 3\}$
$= (-\infty, 3) \cup (3, \infty)$

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

Range of f^{-1} = Domain of $f = \{x \mid x \neq 5\}$
$= (-\infty, 5) \cup (5, \infty)$

Can't have $x-5=0$, $x=5$

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

$\log_6 36 = 2$ $\qquad 6^{?} = 36$

$\log_3 \frac{1}{81} = -4$ $\qquad 3^{?} = \frac{1}{81} = \frac{1}{3^4} = 3^{-4}$

$\log_{16} 4 = \frac{1}{2}$ $\qquad 16^{?} = 4 = \sqrt{16} = 16^{\frac{1}{2}}$

$\log_b \sqrt[3]{b^4} = \frac{3}{4}$ $\qquad b^{?} = \sqrt[3]{b^4} = b^{\frac{3}{4}}$

4. (4pts) Use your calculator to find $\log_{12} 49$ with accuracy 6 decimal places. Show how you obtained your number.

$\log_{12} 49 = \dfrac{\ln 49}{\ln 12} = 1.566184$

5. (12pts) Investigate the effect of increased frequency of compounding: for a deposit of \$4,000 and annual interest rate of 3%, 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 and enter them below.
c) Does compounding more often make a big difference?

a) $A = P\left(1+\frac{r}{n}\right)^{nt}$

$= 4000\left(1+\frac{0.03}{n}\right)^{n}$

b)

Frequency: every	n	Amount after 1 year
year	1	4120
quarter	4	4121.36
month	12	4121.66
day	365	4121.81
hour	8760	4121.82
second	31,536,000	4121.82

c) No, after daily compounding, there is little difference

6. (3pts) Find the domain of $f(x) = \log_7(4+5x)$.

Must have $4+5x>0$

$5x>-4$

$x>-\frac{4}{5}$

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

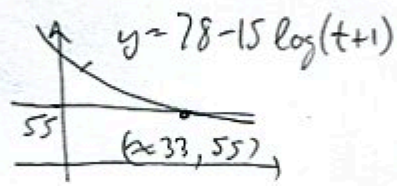
7. (6pts) Students took equivalent forms of the same exam at monthly intervals. The average score $S(t)$ (in percent) was found to be given by the function $S(t) = 78 - 15\log(t+1)$, where t is the number of months after the initial exam.
a) What was the average score on the inital exam? After 5 months? After 15 months? (Round to whole numbers.)
b) Use the intersect feature on the calculator to estimate after how many months is the average score 55%?

a) $S(0)=78$

$S(5)=66$

$S(15)=60$

b) After about 33 months



8. (9pts) Using transformations, draw the graph of $f(x) = 5 + \frac{1}{2}\cdot 3^{-x}$. 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.