College Algebra — Joysheet 6
MAT 140, Spring 2025 — D. Ivanšić

Name: Saul Ocean

Covers: 2.4, 2.5 *Show all your work!*

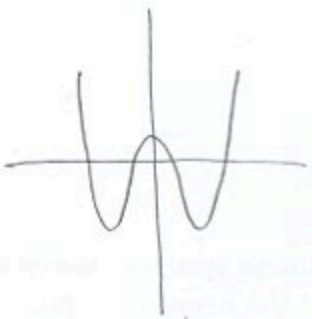
1. (21pts) For the following functions:
a) determine algebraically whether they are odd, even, or neither
b) use the calculator to draw their graphs here and verify your conclusions by stating symmetry.

$f(x) = x^4 - 5x^2 + 2$

$f(-x) = (-x)^4 - 5(-x)^2 + 2$

$= x^4 - 5x^2 + 2 = f(x)$

even



Symm wrt y-axis

$g(x) = \frac{x^5}{120} - \frac{x^3}{6} + x$

$g(-x) = \frac{(-x)^5}{120} - \frac{(-x)^3}{6} + (-x)$

$= \frac{-x^5}{120} - \frac{-x^3}{6} - x$

$= -\frac{x^5}{120} + \frac{x^3}{6} - x = -g(x)$

odd

Symm wrt origin

$h(x) = x^3 - 7|x|$

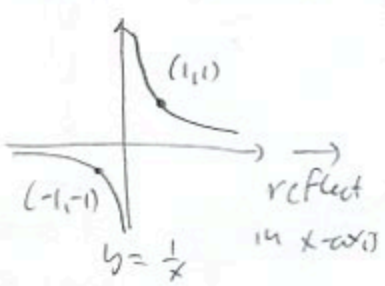
$h_1(-x) = (-x)^3 - 7|-x|$

$= -x^3 - 7|-x|$ $\neq h_1(x)$ $\neq -h(x)$

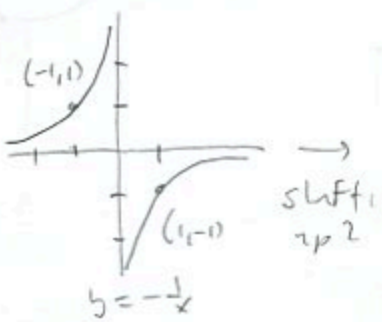
neither

no symmetry

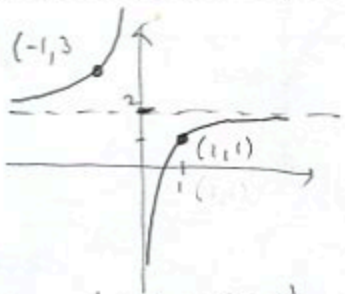
2. (16pts) Draw the graphs of $f(x) = 2 - \frac{1}{x}$ and $g(x) = -4\sqrt{-x}$ using transformations. Explain how you transform graphs of basic functions in order to get the graphs of f and g. Indicate at least two points on each graph.



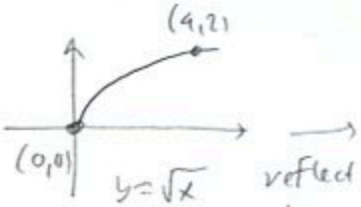
$y = \frac{1}{x}$



$y = -\frac{1}{x}$

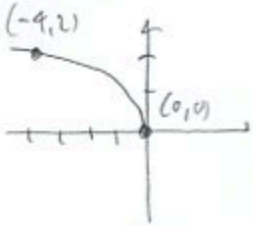


$y = -\frac{1}{x} + 2 = 2 - \frac{1}{x}$



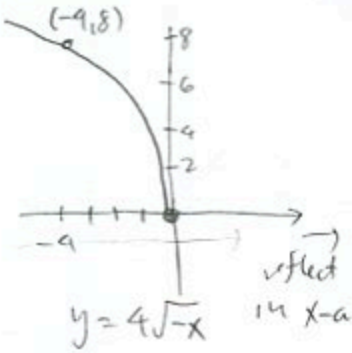
$y = \sqrt{x}$

reflect in y-axis



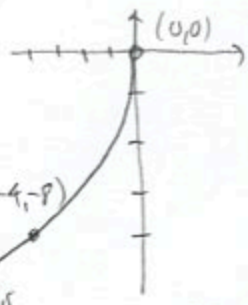
$y = \sqrt{-x}$

vert. stretch factor = 4



$y = 4\sqrt{-x}$

reflect in x-axis



$y = -4\sqrt{-x}$

3. (10pts) Write the equation for the function whose graph has the following characteristics:
a) shape of $y = \sqrt[3]{x}$, shifted right 4 units,
b) shape of $y = |x|$, reflected about the x-axis, then stretched horinzontally by factor 2,
c) shape of $y = x^2$, reflected about the y-axis, then stretched vertically by factor 4, then shifted down 1 unit.

a) $\sqrt[3]{x} \rightsquigarrow \sqrt[3]{x-4}$

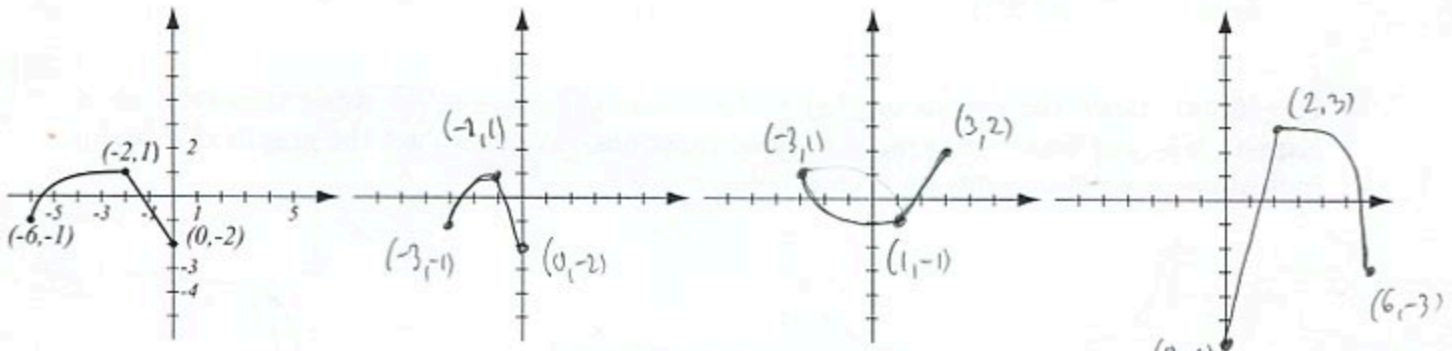
b) $|x| \rightsquigarrow -|x| \rightsquigarrow -\left|\frac{1}{2}x\right|$

(replace x by $\frac{1}{2}x$)

c) $x^2 \rightsquigarrow (-x)^2 \rightsquigarrow 4(-x)^2 \rightsquigarrow 4(-x)^2 - 1$

replace x by $-x$

4. (13pts) The graph of $f(x)$ is drawn below. On separate coordinate systems, sketch the graphs of the functions $f(2x)$, $-f(x-3)$ and $3f(-x)$ and label all the relevant points.



horiz. stretch, factor $\frac{1}{2}$
$x \mapsto \frac{1}{2}x$

shift right 3
reflect in x-axis
$x \mapsto x+3$
$y \mapsto -y$

reflect in x-axis
vert. stretch, factor 3
$x \mapsto -x$
$y \mapsto 3y$