College Algebra — Joysheet 6
MAT 140, Spring 2021 — D. Ivanšić

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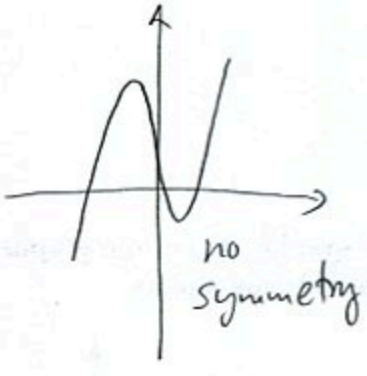
Covers: 2.4, 2.5 *Show all your work!*

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.

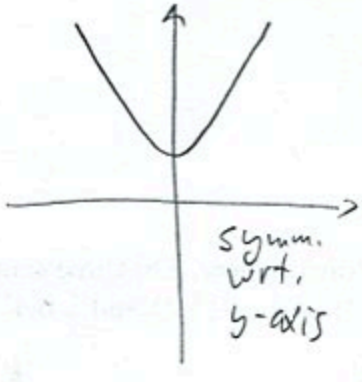
$f(x) = x^3 - 7x + 4$

$f(-x) = (-x)^3 - 7(-x) + 4$
$= -x^3 + 7x + 4$
$\neq f(x) \neq -f(x)$
neither



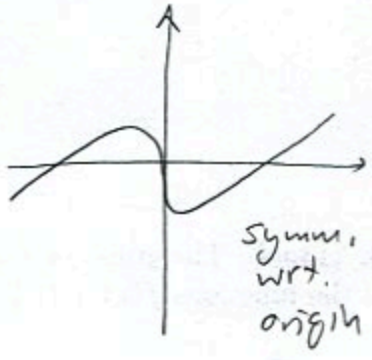
$g(x) = x^2 + 5|x| + 3$

$g(-x) = (-x)^2 + 5|-x| + 3$
$= x^2 + 5|x| + 3$
$= g(x)$
even

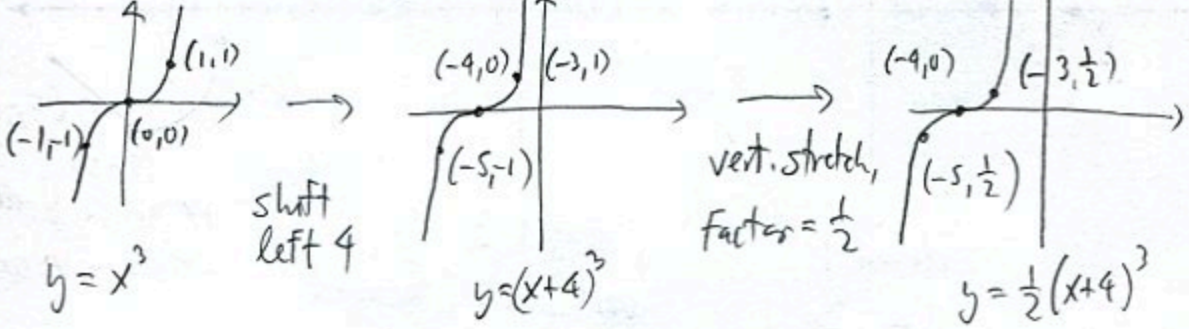


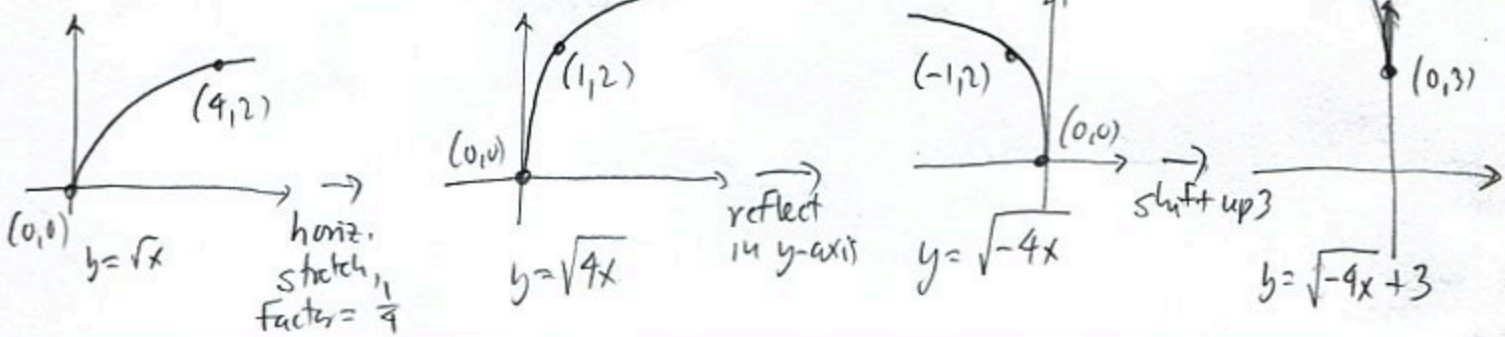
$h(x) = x - 4\sqrt[3]{x}$

$h(-x) = -x - 4\sqrt[3]{-x}$
$= -x - 4(-\sqrt[3]{x})$
$= -x + 4\sqrt[3]{x}$
$= -h(x)$ odd



2. (16pts) Draw the graphs of $f(x) = \frac{1}{2}(x+4)^3$ and $g(x) = 3 + \sqrt{-4x}$ 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.





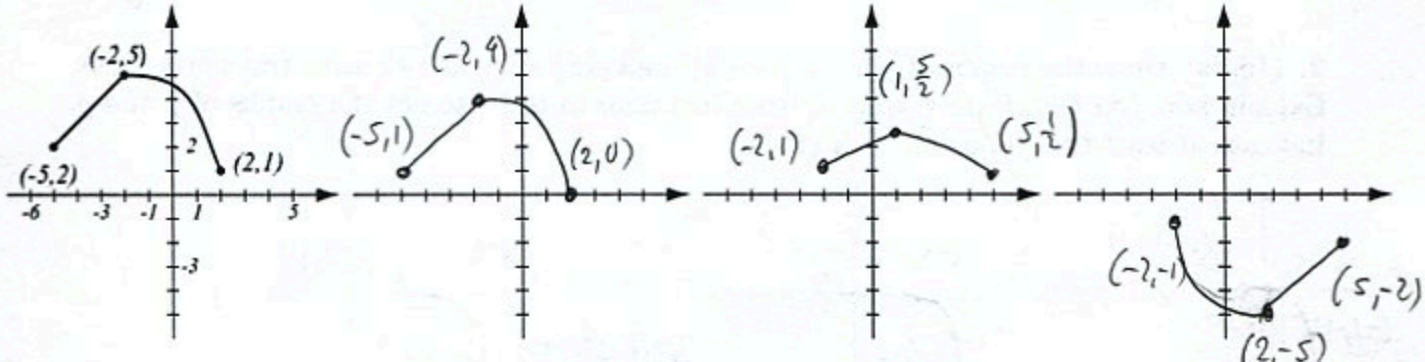
3. (10pts) Write the equation for the function whose graph has the following characteristics:
a) shape of $y = x^2$, shifted left 1 unit
b) shape of $y = \frac{1}{x}$, stretched horizontally by factor 3, then reflected about the y-axis
c) shape of $y = \sqrt[3]{x}$, stretched vertically by factor 4,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

a) $y = x^2 \rightarrow y = (x+1)^2$

b) $y = \frac{1}{x} \rightarrow y = \frac{1}{\frac{1}{3}x} = \frac{1}{\frac{x}{3}} = \frac{3}{x} \rightarrow y = \frac{3}{-x} = -\frac{3}{x}$

c) $y = \sqrt[3]{x} \rightarrow y = 4\sqrt[3]{x} \rightarrow y = -4\sqrt[3]{x} \rightarrow y = -4\sqrt[3]{x} - 1$

4. (13pts) The graph of $f(x)$ is drawn below. On three separate graphs, sketch the graphs of the functions $f(x) - 1$, $\frac{1}{2}f(x-3)$ and $-f(-x)$ and label all the relevant points.



down 1
$y \mapsto y - 1$

right 3
vert. stretch, factor $= \frac{1}{2}$
$x \mapsto x + 3$
$y \mapsto \frac{1}{2}y$

reflect in y-axis
reflect in x-axis
$x \mapsto -x$
$y \mapsto -y$