College Algebra — Joysheet 7
MAT 140, Fall 2015 — D. Ivanšić

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

1. (21pts) For the following functions, determine algebraically whether they odd, even, or neither. Then use the calculator to draw their graphs on paper and verify your conclusions.

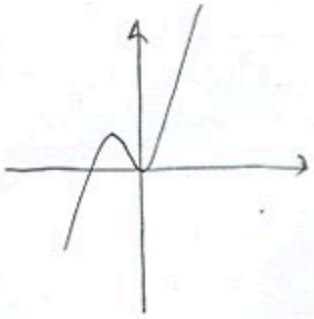
$f(x) = x^3 + x^2$

$f(-x) = (-x)^3 + (-x)^2$

$= -x^3 + x^2$

$\neq f(x) \neq -f(x)$

neither



No symmetry in graph

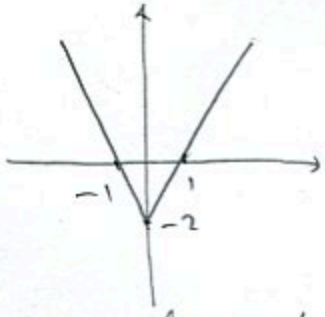
$g(x) = 2|x| - 2$

$g(-x) = 2|-x| - 2$

$= 2|x| - 2$

$= g(x)$

even



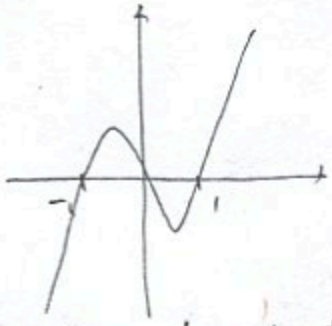
Symmetric about y-axis, so even

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

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

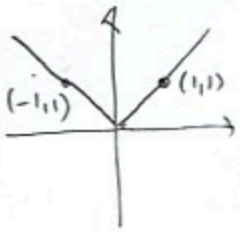
$= -x^3 + x = -h(x)$

odd



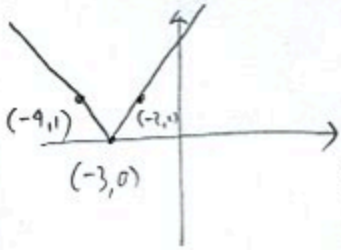
Symmetric about the origin, so odd

2. (16pts) Using transformations, draw the graphs of $f(x) = 2|x+3|$ and $g(x) = -\left(\frac{2}{3}x\right)^2 + 4$. Explain how you transform graphs of basic functions in order to get the graphs of f and g.



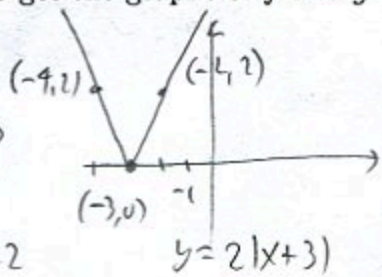
$y = |x|$

shift left 3

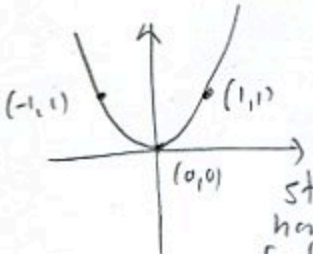


$y = |x+3|$

stretch vert., factor = 2

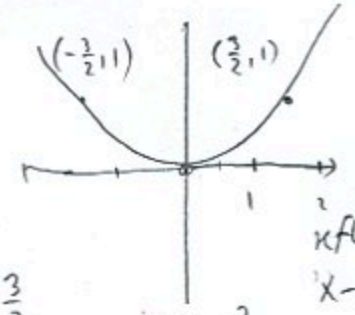


$y = 2|x+3|$



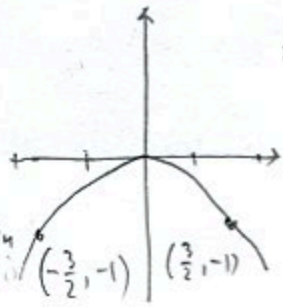
$y = x^2$

stretch horiz. factor = $\frac{3}{2}$

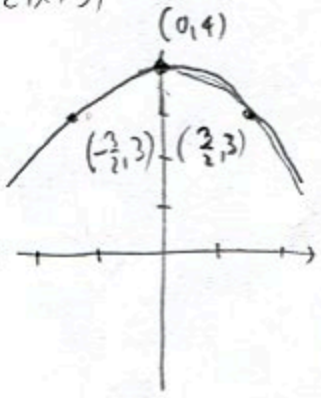


$y = \left(\frac{2}{3}x\right)^2$

reflect in x-axis



shift up 4



3. (9pts) Write the equation for the function whose graph has the following characteristics:
a) shape of $y = x^2$, shifted left 3 units
b) shape of $y = \frac{1}{x}$, stretched horizontally by factor 4, then shifted up 1 unit
c) shape of $y = \sqrt[3]{x}$, stretched vertically by factor 2, then reflected about the y-axis, then shifted right 5 units.

a) $y = (x+3)^2$

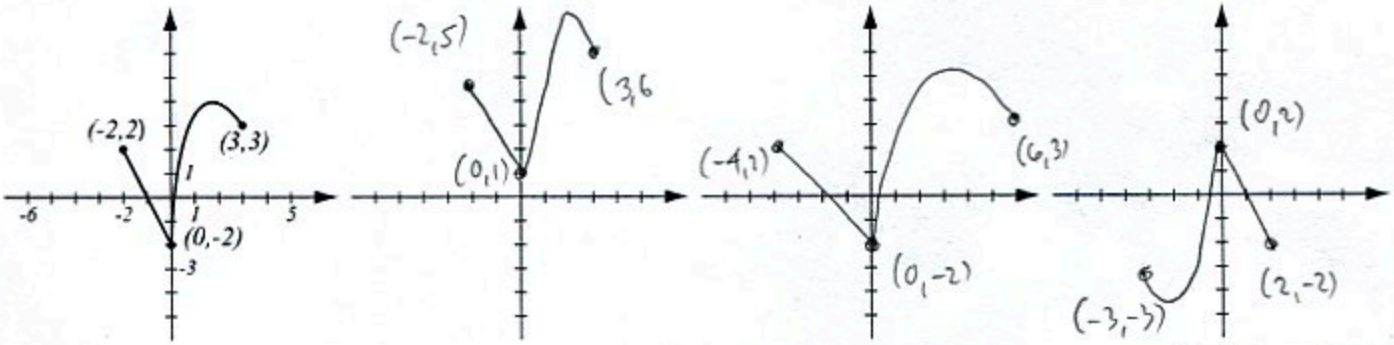
b) $y = \frac{1}{\frac{1}{4}x} = \frac{4}{x}$ $\boxed{y = \frac{4}{x} + 1}$

stretch horiz, factor = 4 then shift up 1

c) $y = 2\sqrt[3]{x}$ $y = 2\sqrt[3]{-x}$ $y = 2\sqrt[3]{-(x-5)} = 2\sqrt[3]{-x+5}$

stretch vert., factor = 2 then reflect in y-axis then shift right 5

4. (14pts) The graph of $f(x)$ is drawn below. On three separate graphs, sketch the graphs of the functions $f(x) + 3$, $f\left(\frac{1}{2}x\right)$ and $-f(-x)$ and label all the relevant points.



shift up 3

stretch horizontally, factor = 2

reflect over y-axis
reflect over x-axis