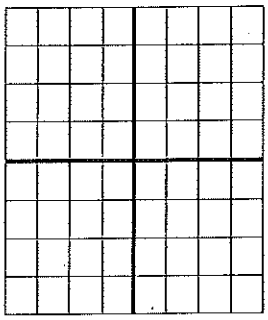
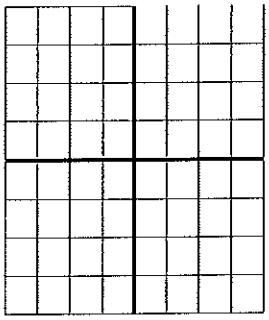
MAT 161 – CLASS NOTES – Section 2.5: Transformation of Functions

1) **Parent Functions**

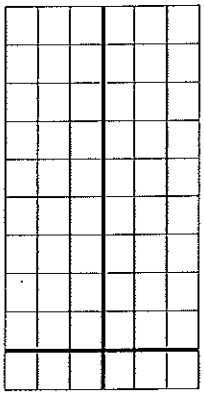
a) **Constant** $f(x)=c$



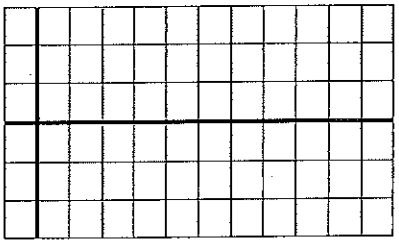
b) **Identity (Linear)** $f(x)=x$



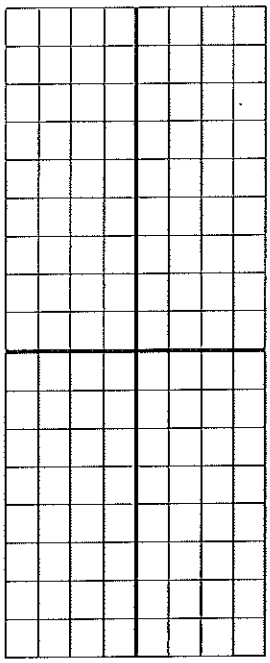
c) **Quadratic** $f(x)=x^2$



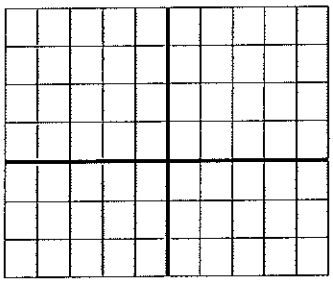
d) **Square Root** $f(x)=\sqrt{x}$



e) **Cubic** $f(x)=x^3$



f) **Absolute Value** $f(x)=|x|$



2) **Shifting:** Given $y=f(x)$ and a constant $c\neq 0$.

a) $y=f(x)+c$ shifts graph up c units

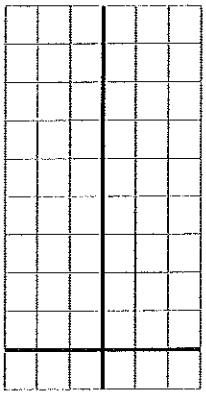
b) $y=f(x)-c$ shifts graph down c units

c) $y=f(x+c)$ shifts graph left c units

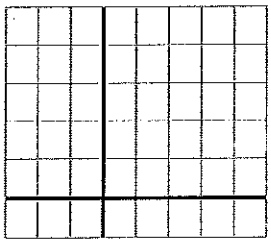
d) $y=f(x-c)$ shifts graph right c units

3) Sketch the following. State the parent function and describe the shift.

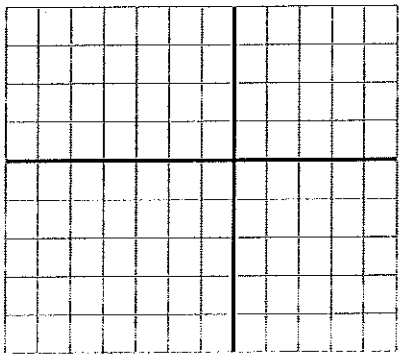
a) $g(x)=x^2+4$



b) $h(x)=(x-1)^2$



c) $k(x)=|x+3|-2$



4) **Stretching, Compressing, & Reflecting**

a) $y=c\cdot f(x)$ stretches vertically by a factor of c

b) $y=\frac{1}{c}\cdot f(x)$ compresses vertically by a factor of c

c) $y=f(c\cdot x)$ compresses horizontally by a factor of c

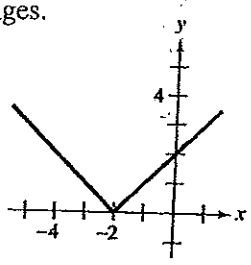
d) $y=f\left(\frac{1}{c}\cdot x\right)$ stretches horizontally by a factor of c

e) $y=-f(x)$ reflects (flips) across the x-axis

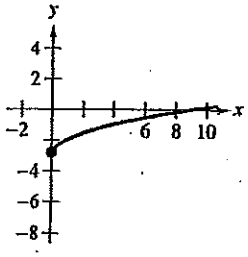
f) $y=f(-x)$ reflects (flips) across the y-axis

5) Write an equation for each function whose graph is shown. Note: Identify the parent and state the changes.

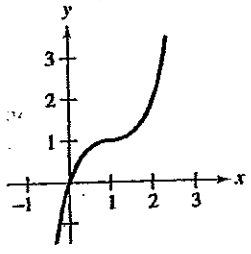
a)



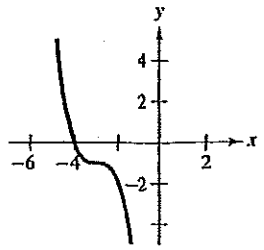
b)



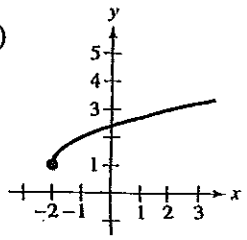
c)



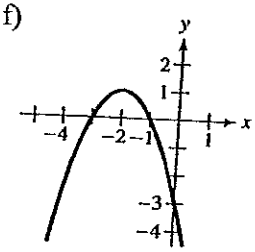
d)



e)

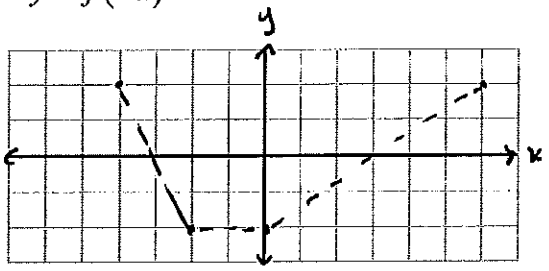


f)

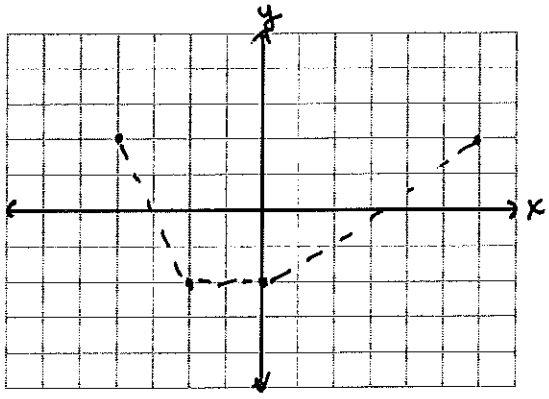


6) Use the graph of f to sketch each graph.

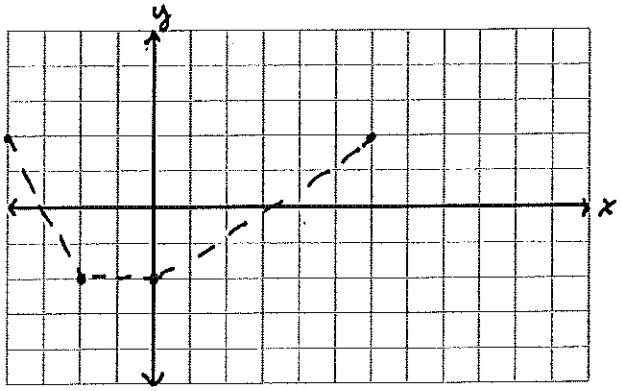
a) $y = f(-x)$



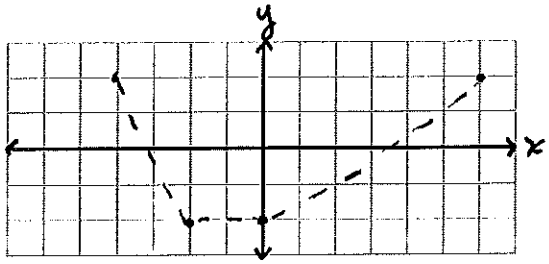
b) $y = 2f(x)$



c) $y = -f(x-4)$



d) $y = f(2x)$



e) Don't graph, but state the transformations.

i) $y = f(x)+4$

ii) $y = f(x)-3$

iii) $y = -f(x)-1$

7) Identify the parent function f and describe the sequence of transformations from f to g.

a) $g(x)=-x^3-1$

b) $g(x)=(x+3)^3-10$

c) $g(x)=2(x-7)^2$

d) $g(x)=6-|x+5|$

8) Write an equation for the function that is described by the given characteristics.

a) The shape of $f(x)=|x|$, but moved one unit to the left and seven units downward.

b) The shape of $f(x)=\sqrt{x}$, but moved three units to the right .