

group work (#5)

$$E^{-1}\begin{pmatrix} 0 \\ 1 \end{pmatrix} = \begin{pmatrix} -4 & 5 \\ 5 & -6 \end{pmatrix} \begin{pmatrix} 0 \\ 1 \end{pmatrix} = \begin{pmatrix} 5 \\ -6 \end{pmatrix} \quad \text{error on key}$$

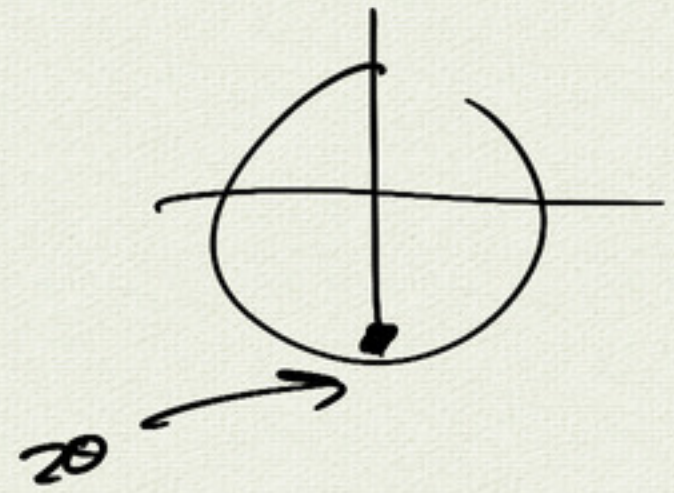
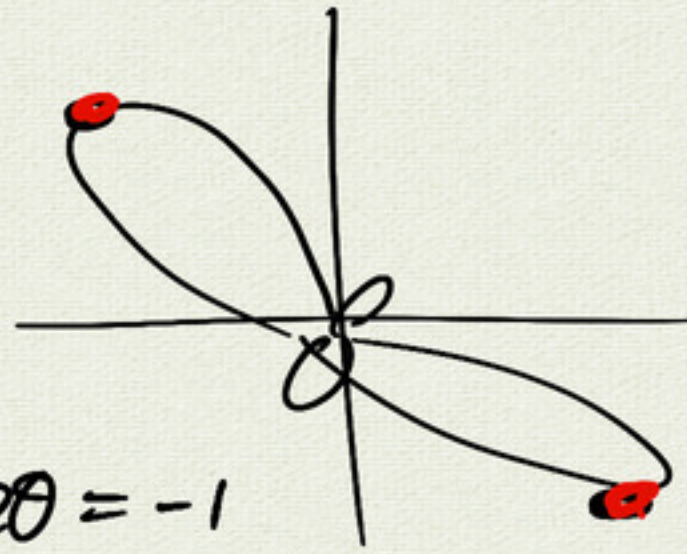
$$r = 1 - 2\sin 2\theta$$

$$\text{Max } |r| = |1 - 2\sin 2\theta|$$

$$= 3 \text{ when } \sin 2\theta = -1$$

$$2\theta = \frac{3\pi}{2} + 2\pi k$$

$$\theta = \frac{3\pi}{4} + \pi k$$



(d)

$$\vec{u} = \langle 2, 2\sqrt{3} \rangle$$

$$|\vec{u}| = 4$$

$$\vec{v} = \langle 3\sqrt{3}, -3 \rangle$$

$$|\vec{v}| = 6$$

angle bet \vec{u} and \vec{v} :

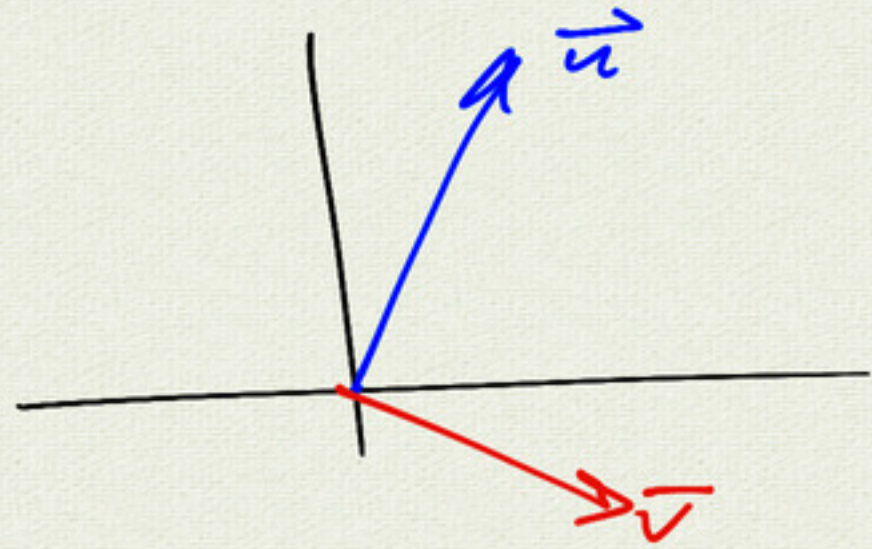
$$\cos \theta = \frac{\vec{u} \cdot \vec{v}}{|\vec{u}| |\vec{v}|}$$

$$= \frac{\langle 2, 2\sqrt{3} \rangle \cdot \langle 3\sqrt{3}, -3 \rangle}{4 \cdot 6}$$

$$= \frac{6\sqrt{3} - 6\sqrt{3}}{24}$$

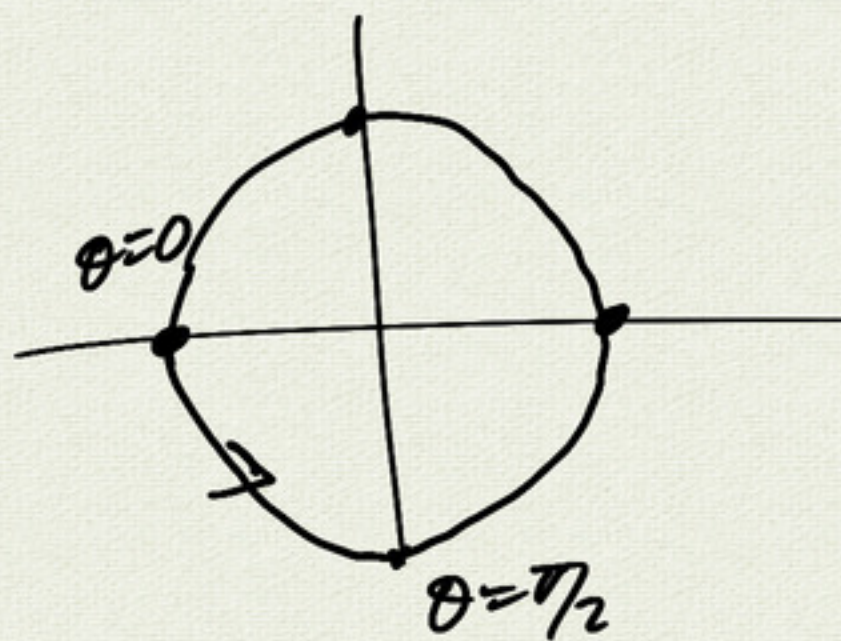
$$= 0 \quad \rightarrow \quad \theta = \frac{\pi}{2} \quad (\text{or } \frac{3\pi}{2})$$

$$\boxed{\vec{u} \cdot \vec{v} = |\vec{u}| |\vec{v}| \cos \theta}$$



$$r = -5$$

θ	r
0	-5
$\pi/2$	-5
π	-5
$3\pi/2$	-5
2π	-5



(3e)

$$x^2 + y^2 = -5y$$

4.2 Function Operations

$$f(x) = x + 5$$

$$g(x) = \sqrt{x}$$

$$(f+g)(x) = f(x) + g(x) \\ = x + 5 + \sqrt{x}$$

also: $f-g$, $f \cdot g$, f/g

$$(f/g)(x) = \frac{f(x)}{g(x)} = \frac{x+5}{\sqrt{x}}$$

domain: $x \neq 0$ (no $\frac{\square}{0}$)
 $x > 0$ (no $\sqrt{\square}$)

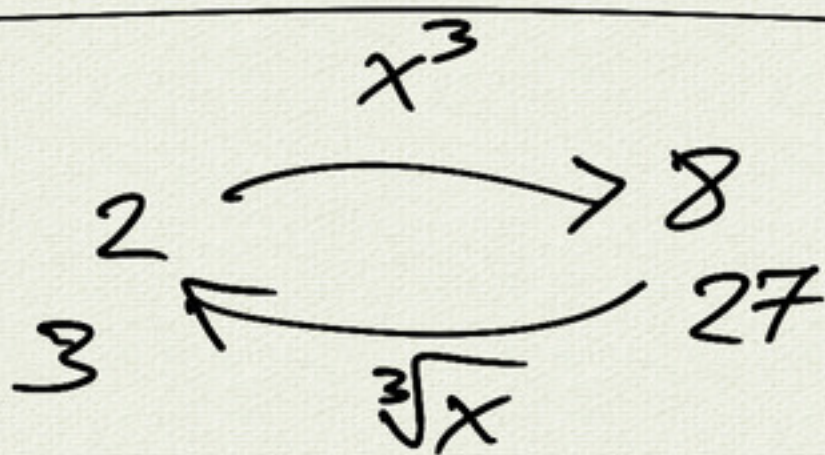
$$(f \circ g)(x) = f(g(x)) \\ = \sqrt{x} + 5$$

$$f(x) = x + 5 \quad f(\square) = \square + 5 \\ g(x) = \sqrt{x} \quad f(g(x)) = g(x) + 5 \\ = \sqrt{x} + 5$$

$$(g \circ f)(x) = g(f(x)) \\ = \sqrt{x+5}$$

f, g are inverse functions if $(f \circ g)(x) = x = (g \circ f)(x)$ for all x

$$f(x) = x^3 \\ \Rightarrow f^{-1}(x) = \sqrt[3]{x}$$



$$f(x) = x^3 - 5 \Rightarrow \text{find } f^{-1}(x)$$

$$y = x^3 - 5 \xrightarrow{\text{swap } x, y} x = y^3 - 5 \\ x + 5 = y^3 \\ y = \sqrt[3]{x+5} \\ f^{-1}(x) = \sqrt[3]{x+5}$$

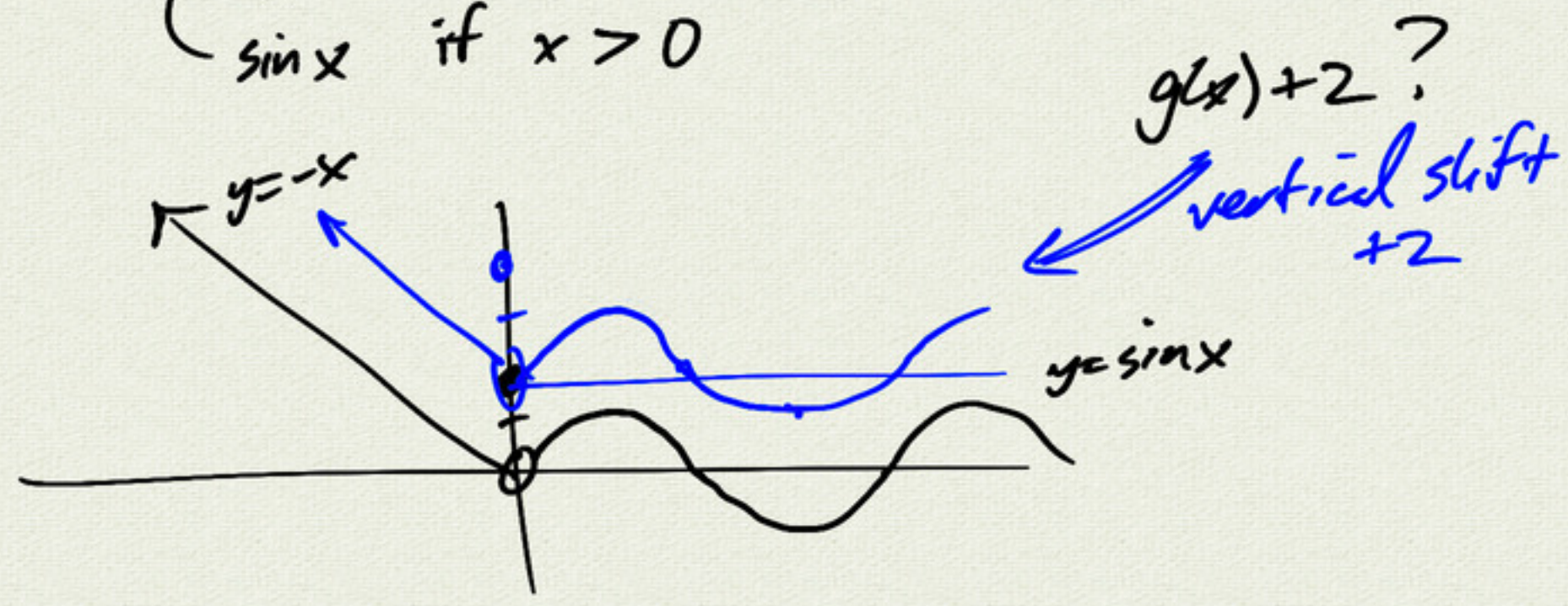
verify: $(f \circ f^{-1})(x) = f(f^{-1}(x)) \\ = (\sqrt[3]{x+5})^3 - 5 \\ = (x+5) - 5 \\ = x \quad \checkmark$

transformations

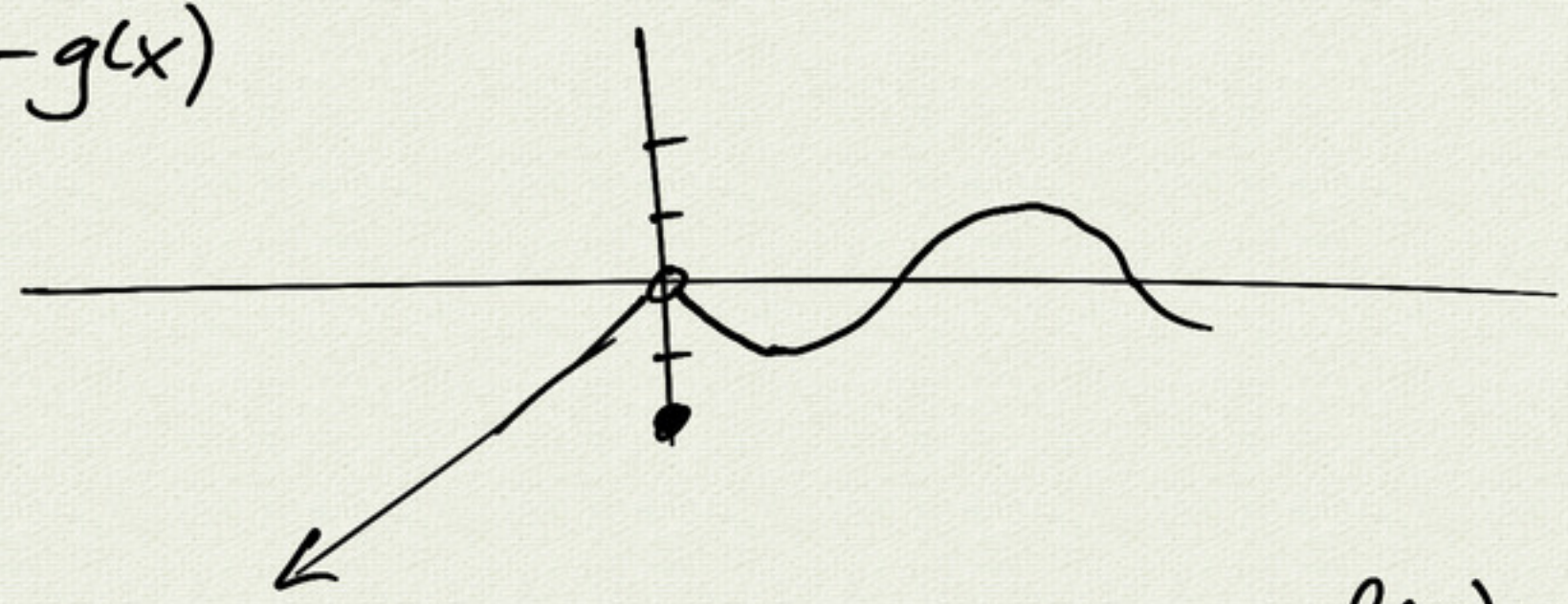
$$f(x) = \sin x \longrightarrow g(x) = a \sin(bx) + k$$

↑ vertical scale
↑ horizontal scale
↑ vertical shift

$$g(x) = \begin{cases} -x & \text{if } x < 0 \\ 2 & \text{if } x = 0 \\ \sin x & \text{if } x > 0 \end{cases}$$

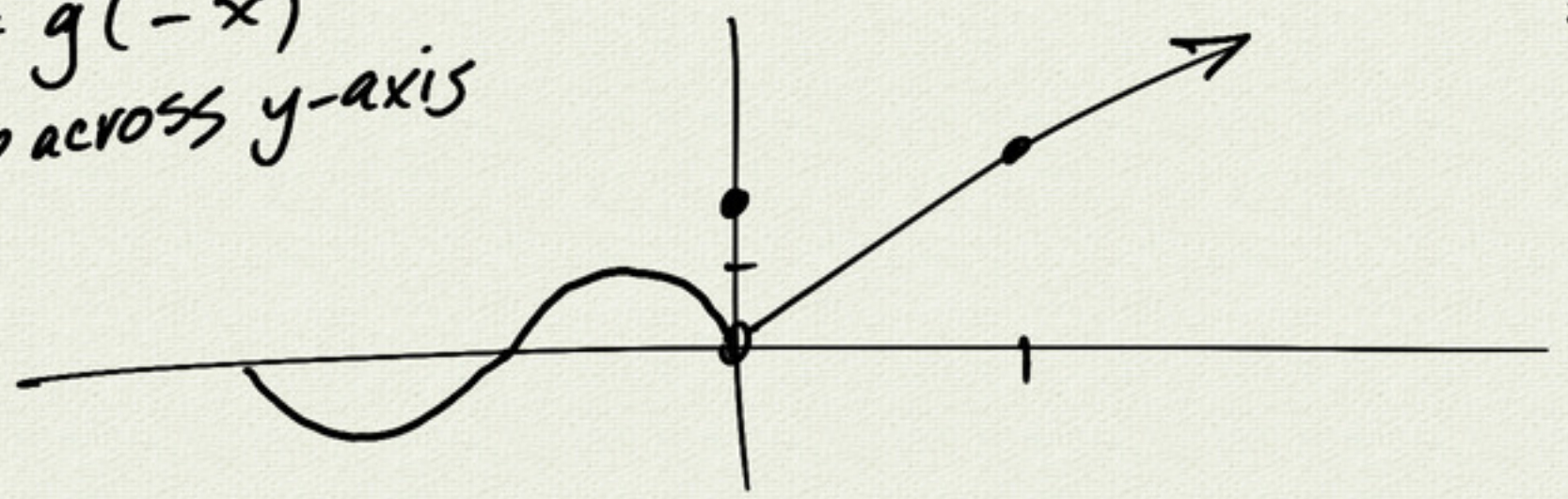


$$y = -g(x)$$



$$h(x) = g(-x)$$

flip across y-axis



$$h(5) = g(-5) = 5$$

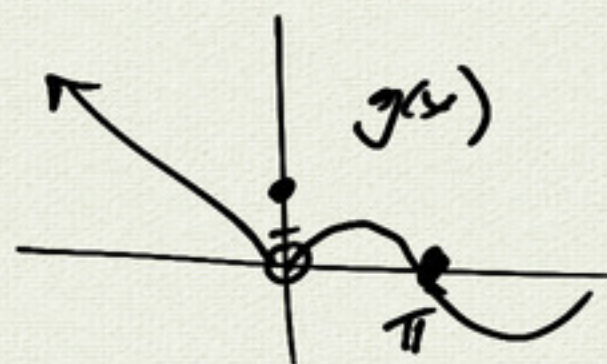
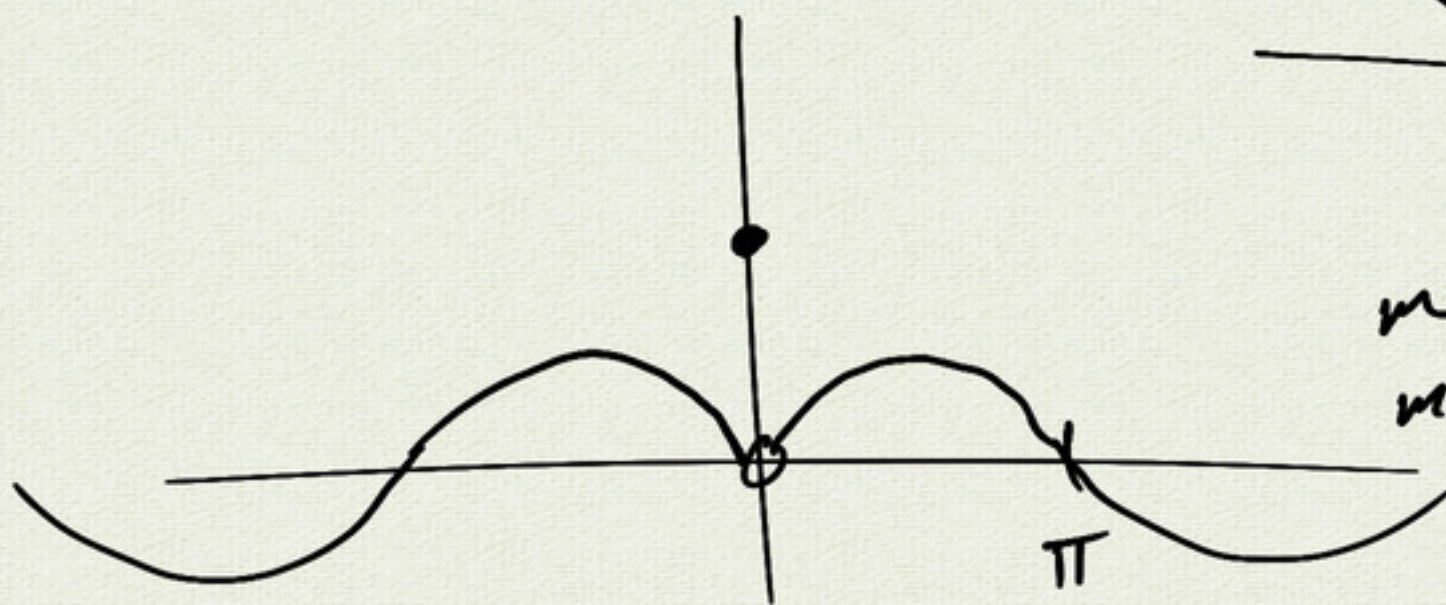
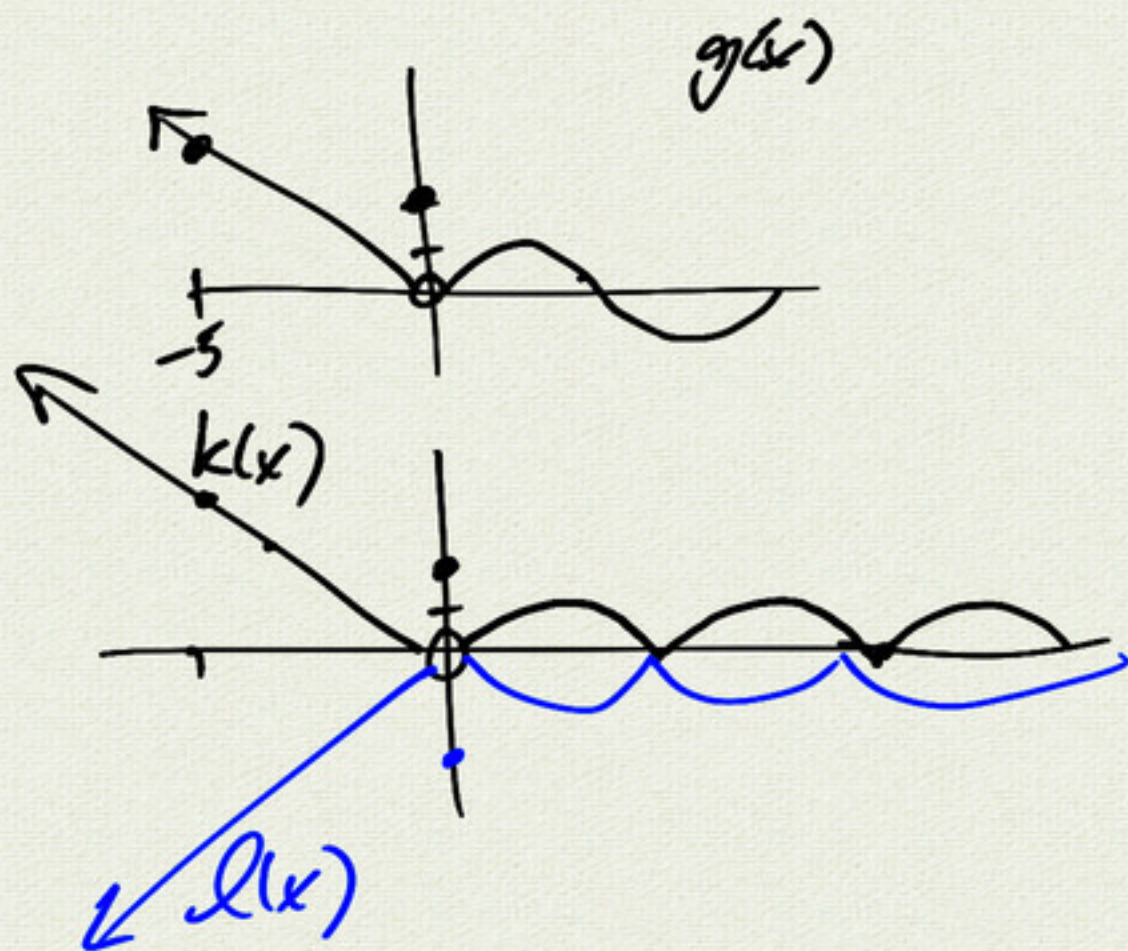
$$k(x) = |g(x)|$$

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

$$(\quad = -k(x))$$

$$m(x) = g(|x|)$$

$$n(x) = g(\underbrace{-|x|})$$



$$m(\pi) = g(\pi)$$

$$m(-\pi) = g(|-\pi|)$$

$$= g(\pi)$$

