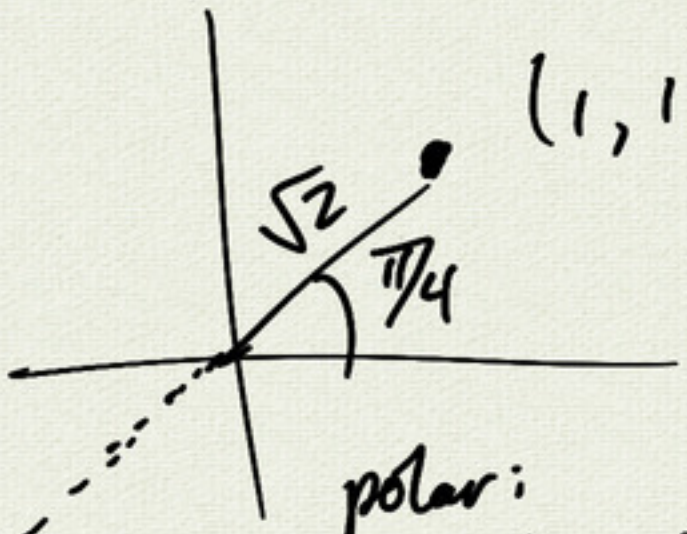
Group work

(3)



(1, 1)

polar:

$(\sqrt{2}, \frac{\pi}{4} + 2\pi k)$

$(-\sqrt{2}, \frac{5\pi}{4} + 2\pi k)$

$-\frac{3\pi}{4}$

Key:

#5

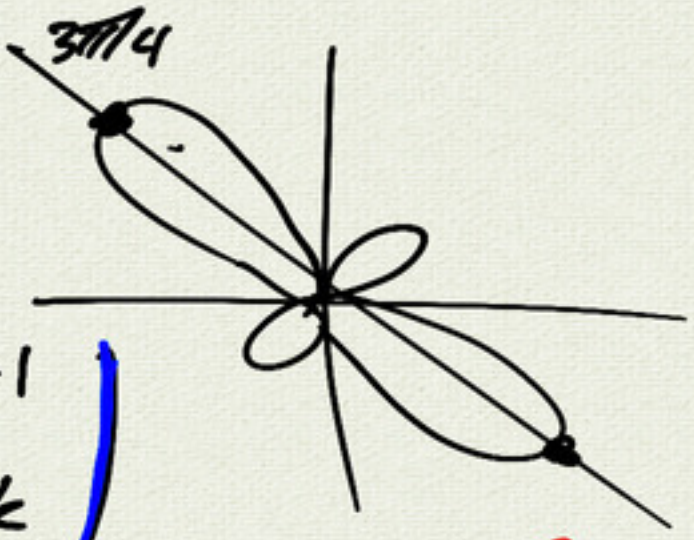
$E^{-1}\begin{pmatrix}0\\1\end{pmatrix}$

$= \begin{pmatrix}-4 & 5\\ 5 & -6\end{pmatrix}\begin{pmatrix}0\\1\end{pmatrix}$

$= \begin{pmatrix}5\\-6\end{pmatrix}$

$(k \in \mathbb{Z})$

(4) $r = 1 - 2\sin 2\theta$



max $|r| = 3$ when $\sin 2\theta = -1$

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

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

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

$r = 1 - 2$

$= -1$

where? $\sin 2\theta = 1$

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

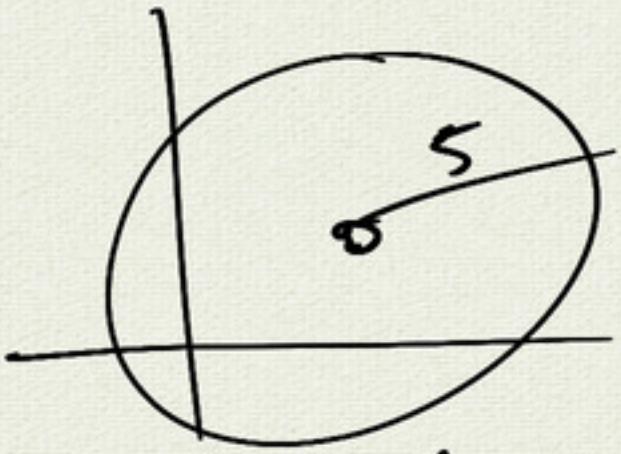
$\theta = \frac{\pi}{4} + \pi k$

#2

center $(3,4)$

radius 5

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3 \\ 4 \end{pmatrix} + \begin{pmatrix} 5\cos t \\ 5\sin t \end{pmatrix}$$



$x(t) = 3 + 5\cos t$

$y(t) = 4 + 5\sin t$

b

period $= 6 \Longrightarrow$ period $\frac{2\pi}{b} = 6$

$\Leftrightarrow b = \frac{2\pi}{6}$

$x(t) = 3 + 5\cos\left(\frac{2\pi}{6}t\right)$

$y(t) = 4 + 5\sin\left(\frac{2\pi}{6}t\right)$

4.2 Function Operations

$f(x) = x+7$

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

$(f+g)(x) = f(x) + g(x)$

$= (x+7) + \sqrt{x}$

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

$(f/g)(x) = \frac{x+7}{\sqrt{x}}$ domain: $x > 0$

$(x=0 \Rightarrow$ no divide by 0$)$

$(x<0 \Rightarrow$ no square root of negative$)$

NO: $\frac{\square}{0}$ $\sqrt{-\square}$

$(f \circ g)(x) = f(g(x))$ composition

$= f(\sqrt{x})$

$= \sqrt{x} + 7$

$f(x) = x+7$

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

$(g \circ f)(x) = g(f(x))$

$= \sqrt{x+7}$

domain: $x+7 \geq 0$

$x \geq -7$

inverse functions:

f, g are <u>inverses</u> if $(f \circ g)(x) = x = (g \circ f)(x)$

$f(x) = \frac{1}{2}x$

$g(x) = 2x$

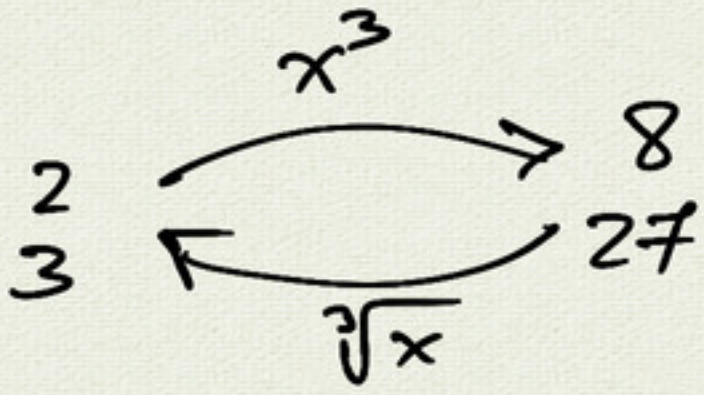
$(f \circ g)(x) = \frac{1}{2}(g(x))$

$= \frac{1}{2}(2x)$

$= x$

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

"f inverse"



$f(x) = x^3 + 5 \Rightarrow$ what is $f^{-1}(x)$?

$y = x^3 + 5$ $\xrightarrow[x,y]{\text{swap}}$ $x = y^3 + 5$

$x - 5 = y^3$

$y = \sqrt[3]{x-5}$

$f^{-1}(x) = \sqrt[3]{x-5}$

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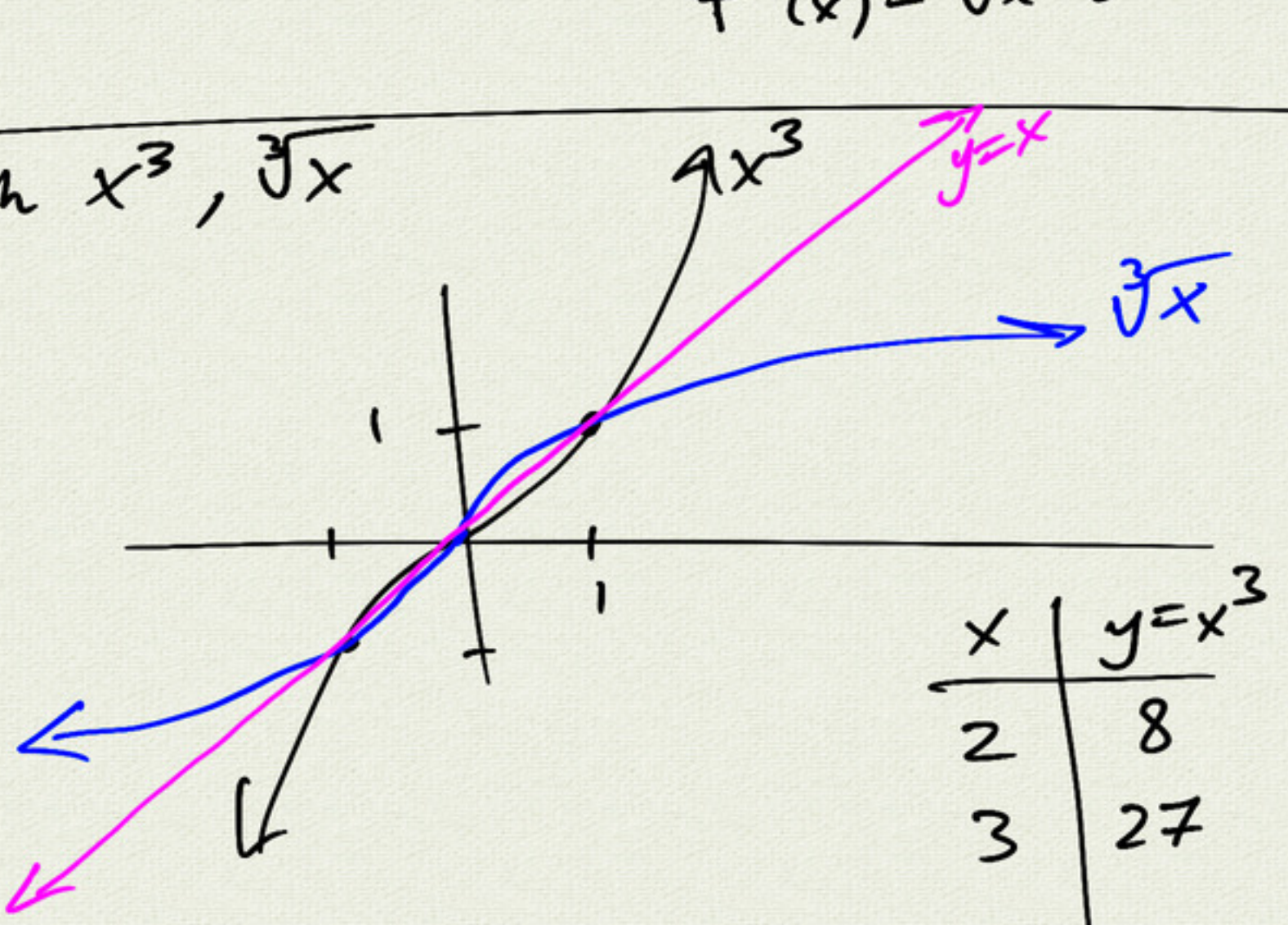
graph x^3, $\sqrt[3]{x}$



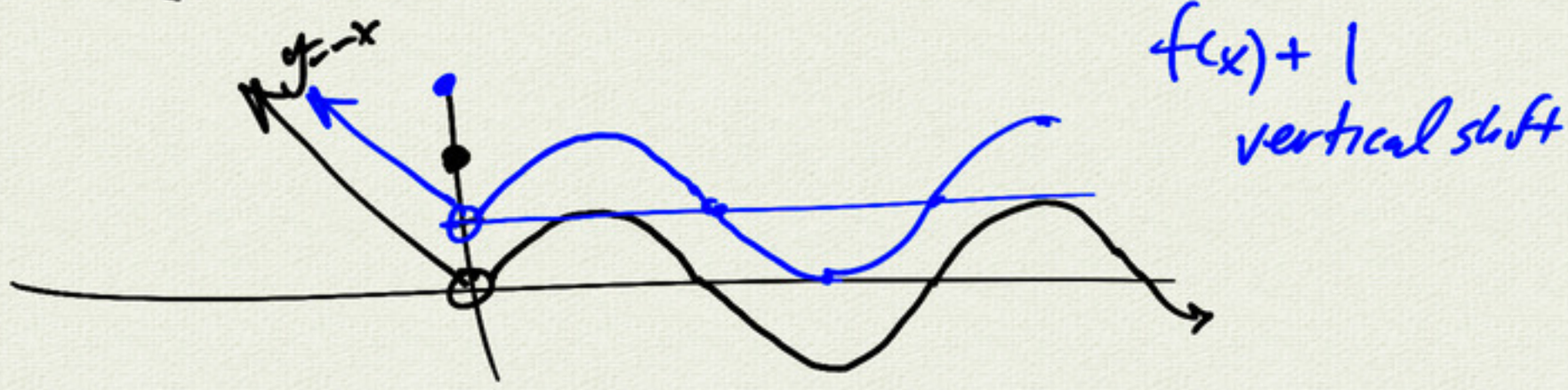
x	$y = x^3$
2	8
3	27

$\sin(x) \Longrightarrow$ $f(x) = a\sin(b(x-h)) + k$

vertical scale — a

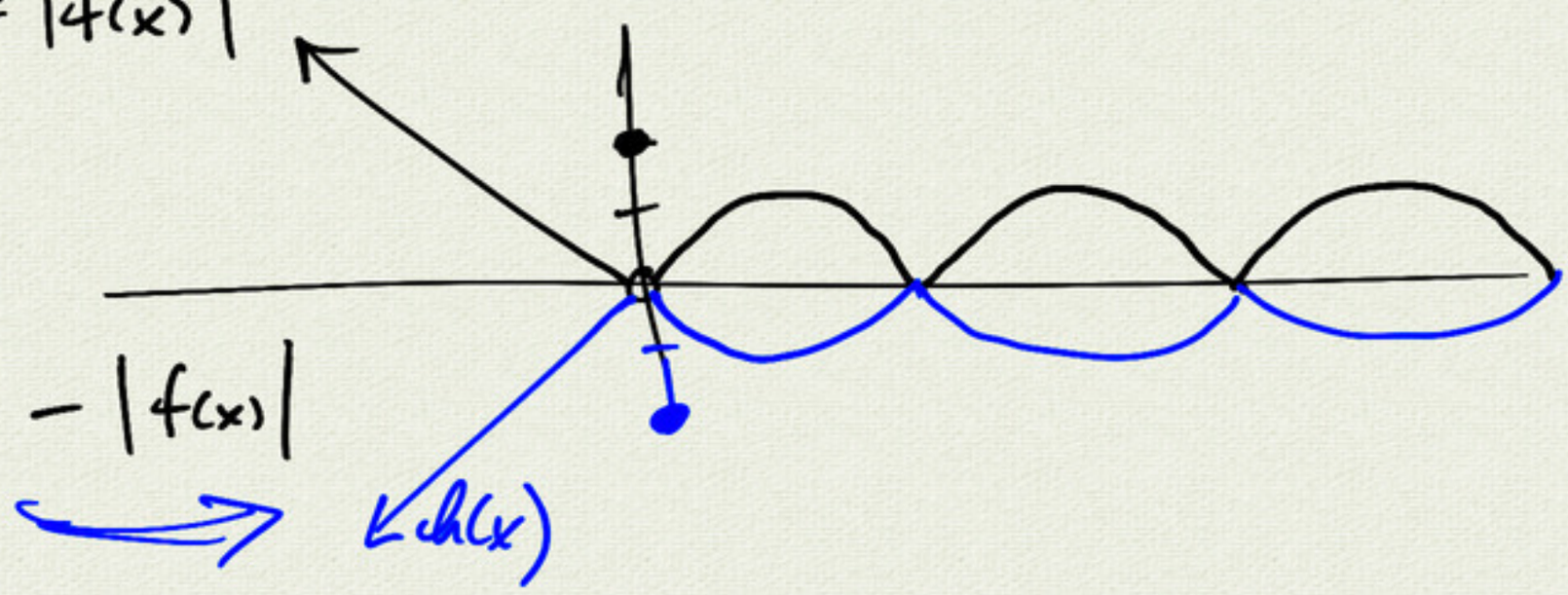
vertical shift — k

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

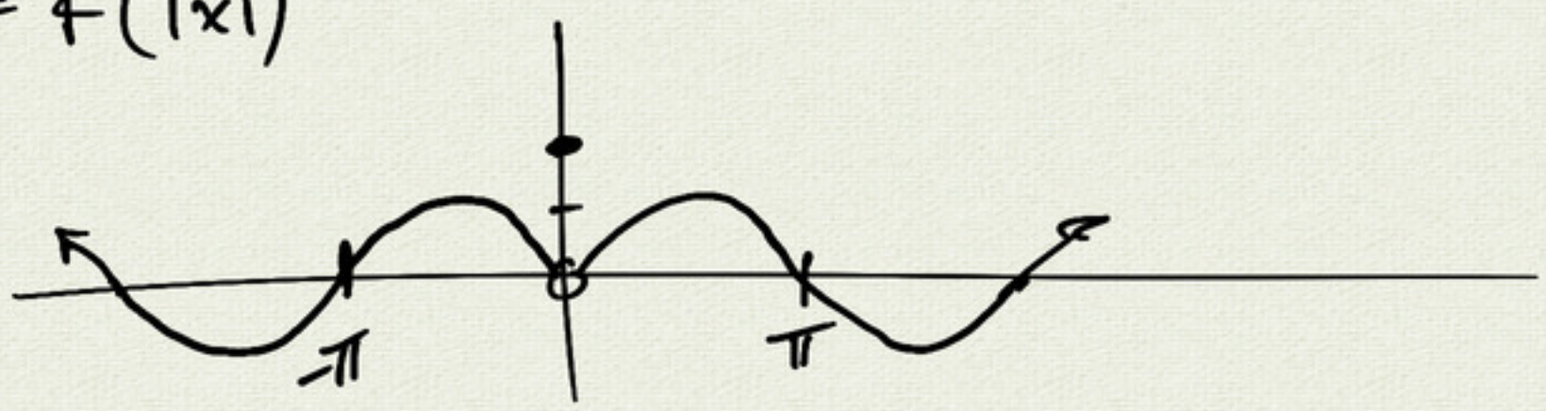


$g(x) = |f(x)|$

$h(x) = -|f(x)|$



$k(x) = f(|x|)$



$k(-\pi) = f(|-\pi|)$

$= f(\pi)$

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