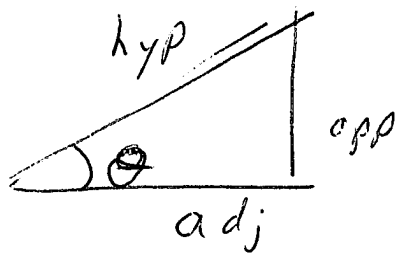
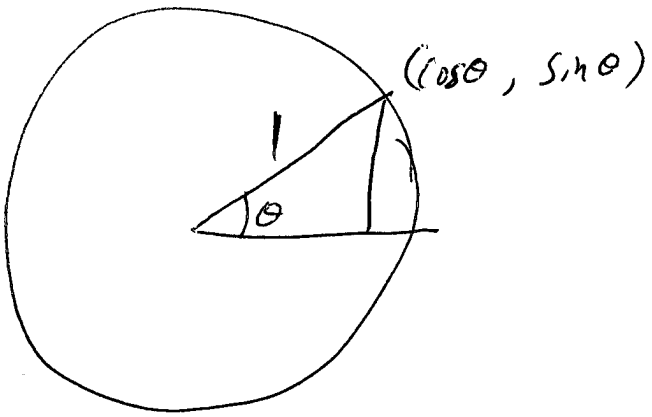
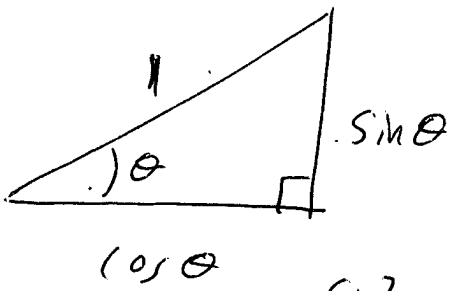


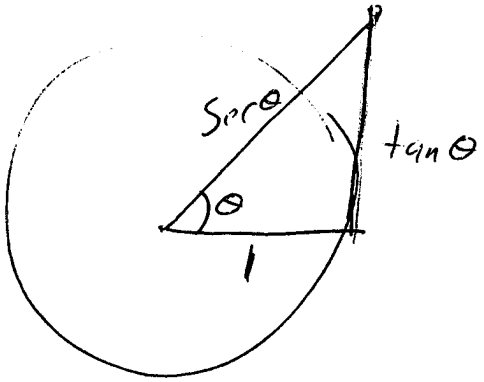
$$\sin\theta = \frac{opp}{hyp} \qquad \cos\theta = \frac{adj}{hyp}$$

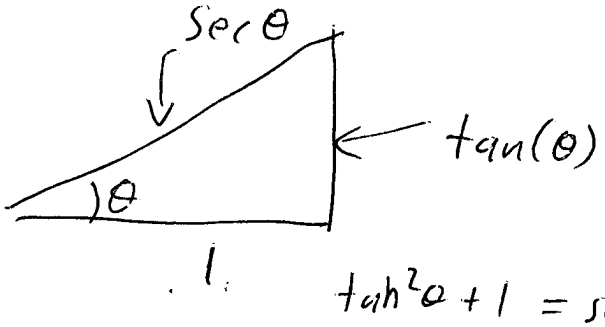
$$\tan\theta = \frac{opp}{adj}$$





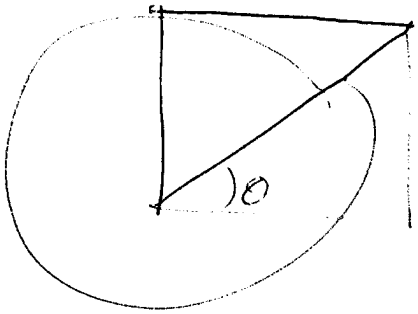
$$\sin^2\theta + \cos^2\theta = 1$$

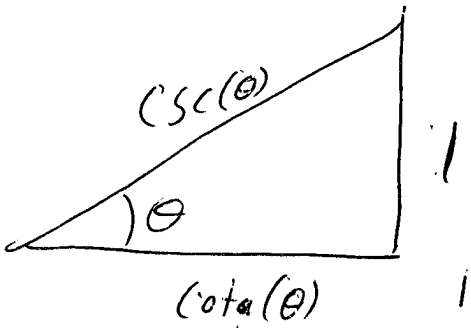




$$\tan^2\theta + 1 = \sec^2\theta$$

$$\frac{1}{h} = \cos\theta \qquad h = \frac{1}{\cos\theta} = \sec\theta$$



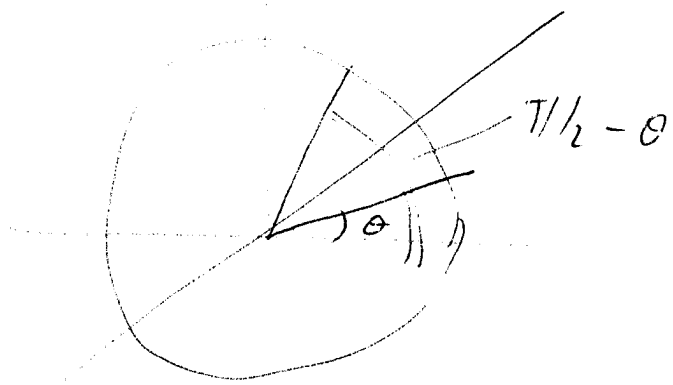


$$1 + \cot^2\theta = \csc^2\theta$$

θ	degrees	$\sin(\theta)$	$\cos(\theta)$	$\tan\theta$	$\cot$ ~~sec~~	sec	csc
0	0	0	1	0	DNE	1	DNE
$\pi/6$	30	$1/2$	$\sqrt{3}/2$	$\frac{1}{\sqrt{3}}=\frac{\sqrt{3}}{3}$	$\sqrt{3}$	$\frac{2}{\sqrt{3}}$	2
$\pi/4$	45	$\sqrt{2}/2$	$\sqrt{2}/2$	1	1	$\sqrt{2}$	$\sqrt{2}$
$\pi/3$	60	$\sqrt{3}/2$	$1/2$	$\sqrt{3}$	$\frac{\sqrt{3}}{3}$	2	$2/\sqrt{3}$
$\pi/2$	90	1	0	DNE	0	DNE	1
π	180	0	-1	0	DNE	-1	DNE
$3\pi/2$	270	-1	0	DNE	0	DNE	-1
2π	360	0	1	0	DNE	1	DNE

$\cos(\pi/2 - \theta) = \sin\theta$

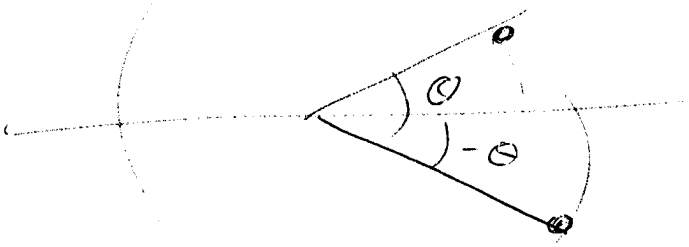
$\sin(\pi/2 - \theta) = \cos\theta$



$\cos(b/ah)(\pi/2 - \theta) = b/ah(\theta)$

$\cos(-\theta) = \cos(\theta)$

$\sin(-\theta) = -\sin(\theta)$



$\sin(\theta) = \cos(\pi/2 - \theta) = \cos(\theta - \pi/2)$

$\sin(A+B) = \sin(A)\cos(B) + \sin(B)\cos(A)$

$\cos(A+B) = \cos(A)\cos(B) - \sin(A)\sin(B)$

$\sin(A-B) = \sin A \cos B - \sin B \cos A$

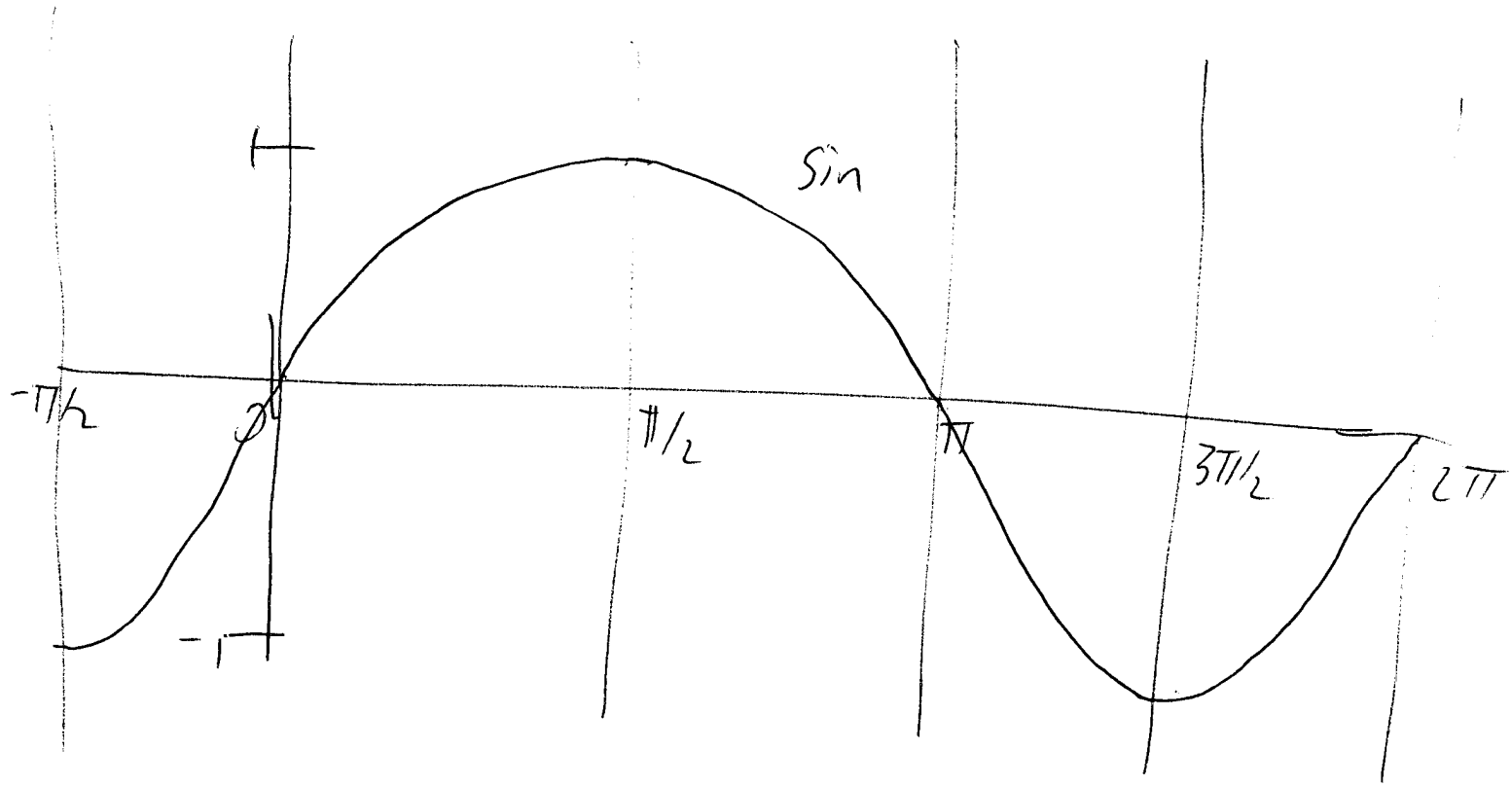
$\cos(A-B) = \cos A \cos B + \sin A \sin B$

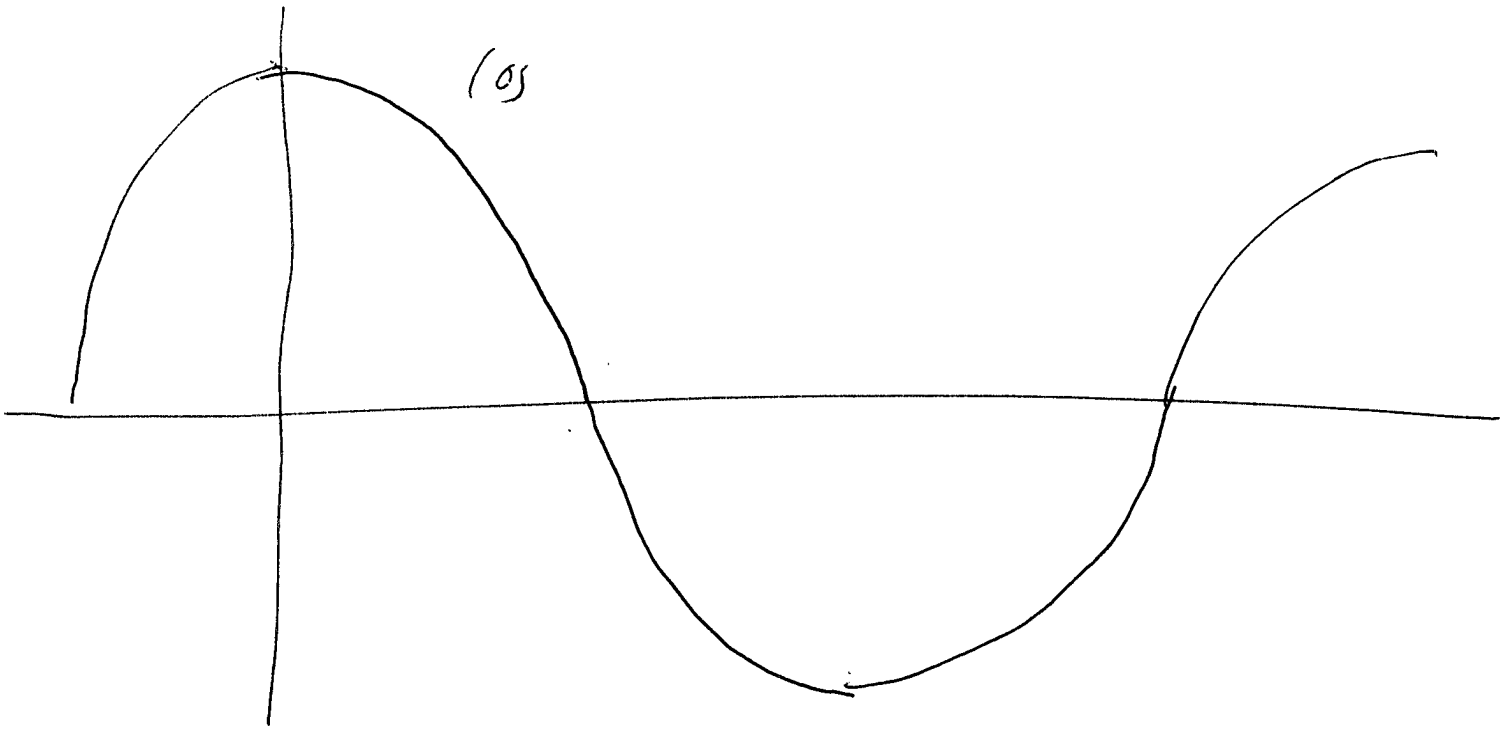
$\sin(2A) = 2\sin A \cos A$

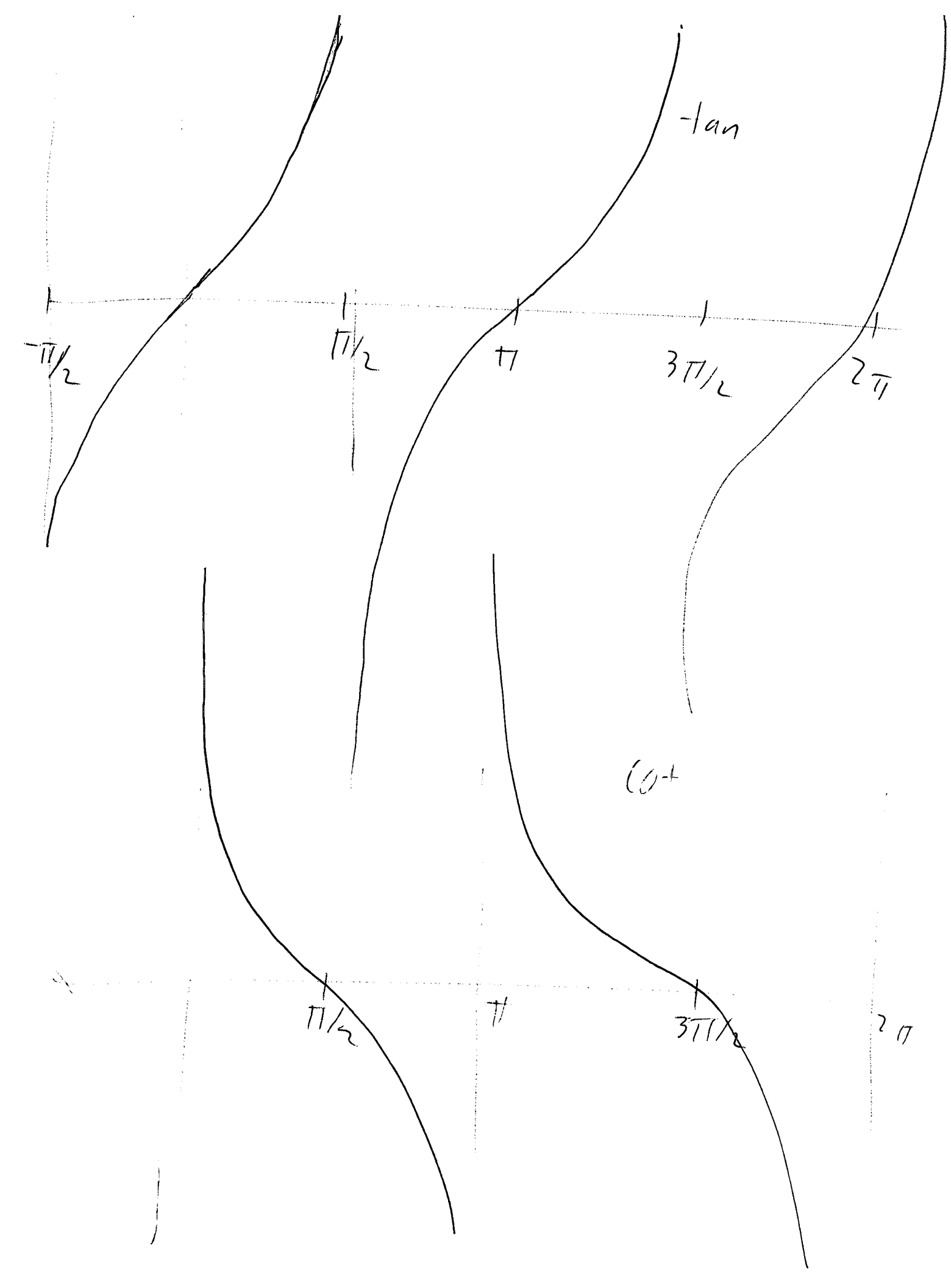
$\cos(2A) = \cos^2 A - \sin^2 A = 1 - 2\sin^2 A = 2\cos^2 A - 1$

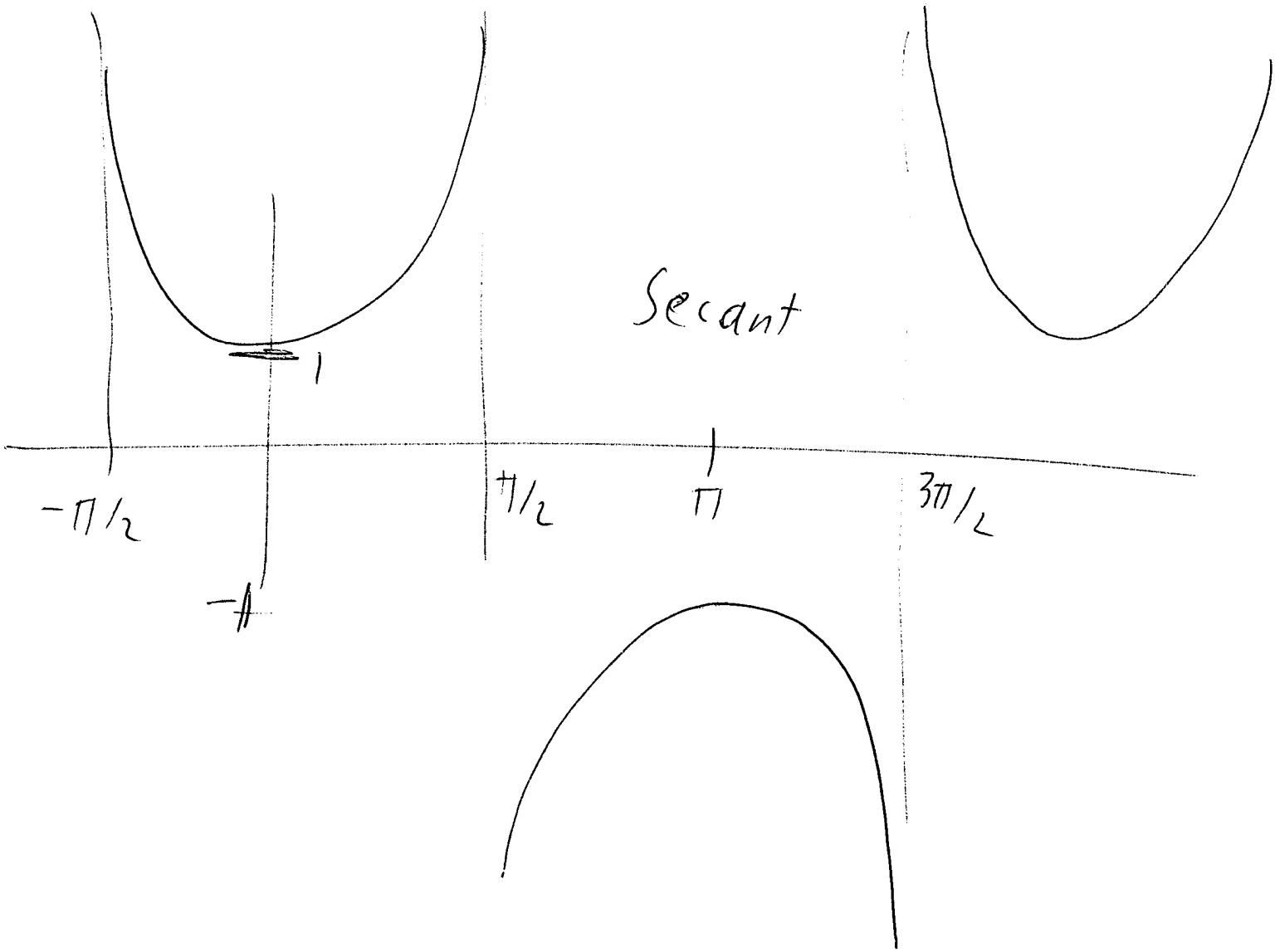
$$\cos\left(\frac{A}{2}\right) = \pm\sqrt{\frac{1+\cos(A)}{2}}$$

$$\sin\left(\frac{A}{2}\right) = \pm\sqrt{\frac{1-\cos(A)}{2}}$$


Sin
1
-1
-π/2
0
π/2
π
3π/2
2π


Cos


-tan
-π/2
π/2
π
3π/2
2π
cot
π/2
π
3π/2
2π


Secant
1
-1
-π/2
π/2
π
3π/2

$2^3 = 2 \cdot 2 \cdot 2$

$2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

If x is a positive integer,

$a^x = \underbrace{a \cdot a \cdot a \cdots a}_{x \text{ times}}$

$2^3 2^5 = (2 \cdot 2 \cdot 2)(2 \cdot 2 \cdot 2 \cdot 2 \cdot 2) = 2^8$

(1) $a^b a^c = a^{b+c}$

$(2^3)^5 = (2 \cdot 2 \cdot 2)(2 \cdot 2 \cdot 2)(2 \cdot 2 \cdot 2)(2 \cdot 2 \cdot 2)(2 \cdot 2 \cdot 2)$

$= 2^{15}$

(2) $(a^b)^c = a^{bc}$

$2^0 = 1$ since $2^0 \cdot 2^3 = 2^{0+3} = 2^3$

$a^0 = 1$ if $a \neq 0$

2^{-137} $2^{-137} \cdot 2^{137} = 2^0 = 1$

$a^{-b} = \frac{1}{a^b}$ if $a \neq 0$

(3) $a^{b-c} = \frac{a^b}{a^c}$

$2^{1/2} \cdot 2^{1/2} = 2^{\frac{1}{2}+\frac{1}{2}} = 2$

$a^{1/2} = \sqrt{a}$

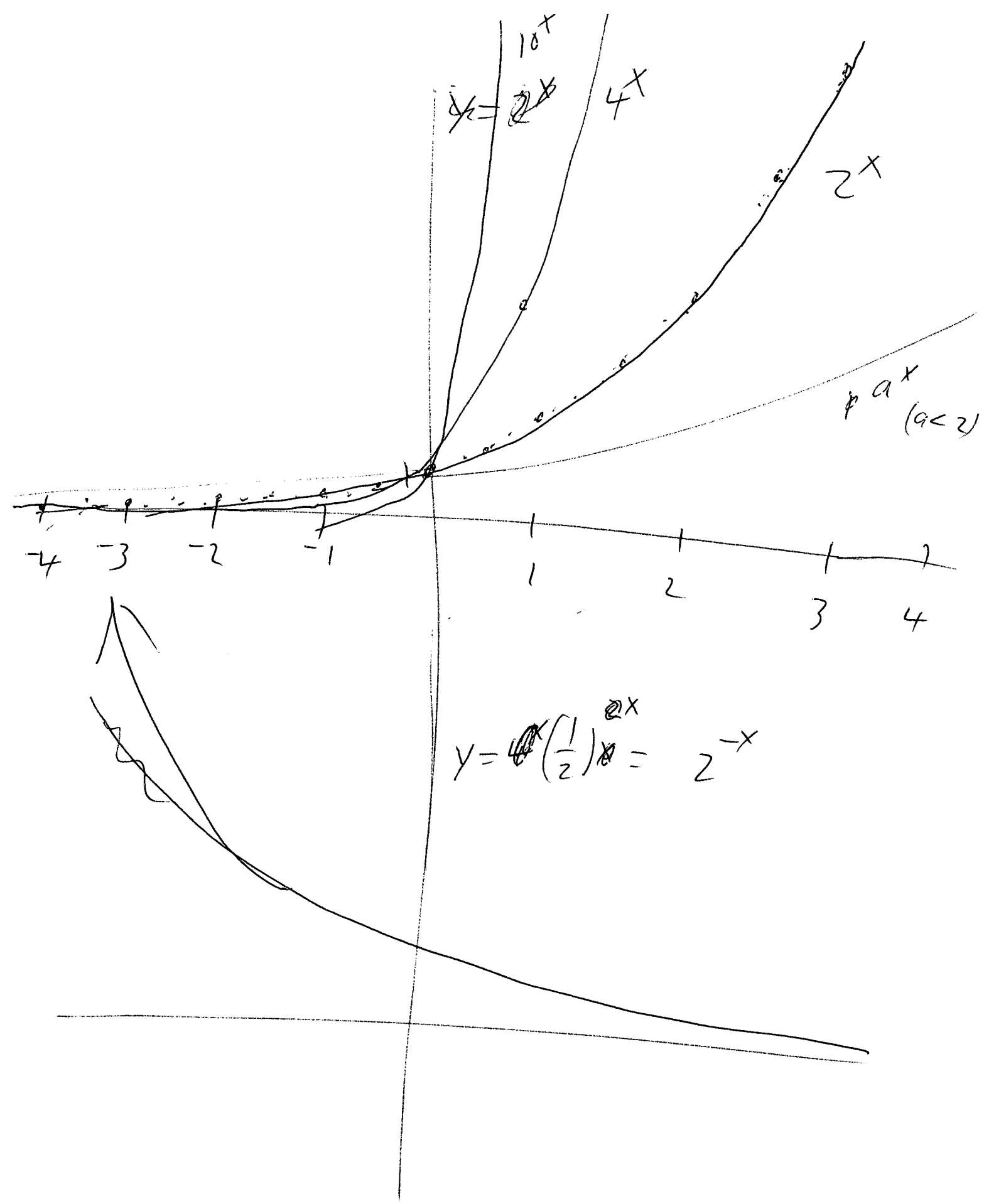
$(a^{p/q})^q = a^p$

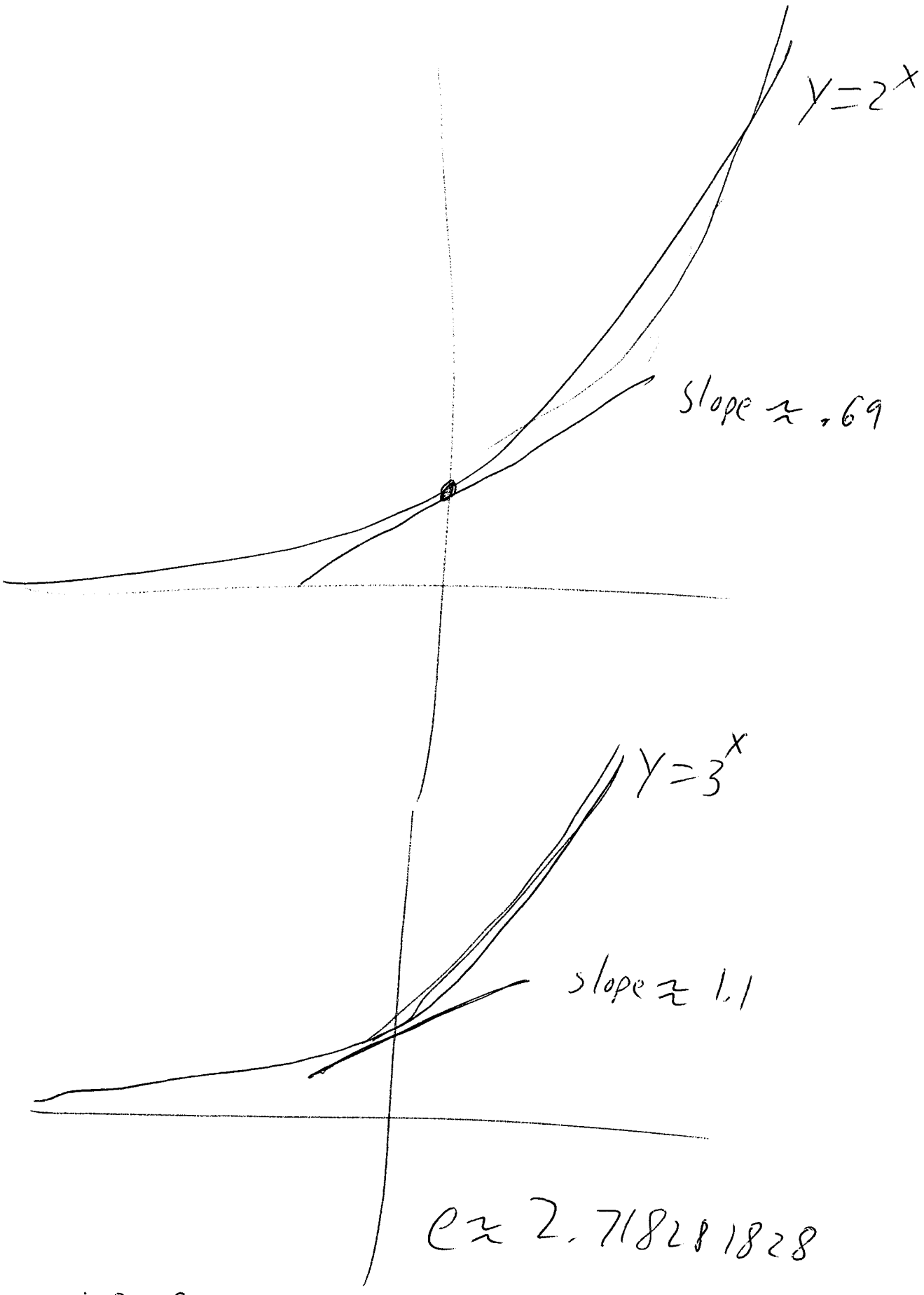
$a^{p/q} = \sqrt[q]{a^p}$

$= (\sqrt[q]{a})^p$

$2^{\pi} = ?$ number really close to

$2^{3.14159265}$


10^x
4^x
2^x
a^x $(a<2)$
-4
-3
-2
-1
1
2
3
4
$y = \left(\frac{1}{2}\right)^x = 2^{-x}$



$e \approx 2.718281828$

If $f(x) = e^x$, slope of tangent at $x = 0$ is 1

$a^x = \underbrace{a \cdot a \cdots a}_{x \text{ times}}$ (sort of)

$a^{-x} = \frac{1}{a^x}$

$a^0 = 1$

$a^{p/q} = \sqrt[q]{a^p} = \left(\sqrt[q]{a}\right)^p$

Basic properties of exponents.

$a^x a^y = a^{x+y}$

$\frac{a^x}{a^y} = a^{x-y}$

$(a^x)^y = a^{xy}$

$(ab)^x = a^x b^x$

All exponential functions are same, up to horizontal scale. $4^x = 2^{2x}$, $8^x = 2^{3x}$

$\left(\frac{1}{2}\right)^x = 2^{-x}$, etc.