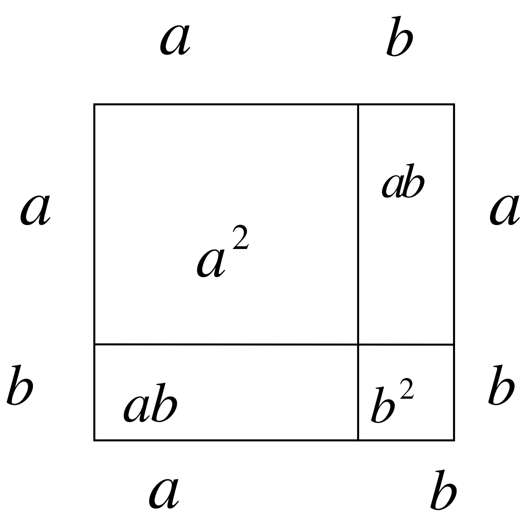
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	54	64	72	80
9	18	27	36	45	54	63	72	81	90

$1^2=1$ $2^2=4$ $3^2=9$ $4^2=16$ $5^2=25$ $6^2=36$ $7^2=49$ $8^2=64$ $9^2=81$ $10^2=100$

$$(a+b)^2=a^2+2ab+b^2$$



$11^2=121$ $12^2=144$ $13^2=169$ $14^2=196$

$15^2=225$ $16^2=256$ $17^2=289$ $18^2=324$

$19^2=361$ $20^2=400$

$2^2=4$ $2^3=8$ $2^4=16$ $2^5=32$

$2^6=64$ $2^7=128$ $2^8=256$ $2^9=512$

$2^{10}=1024$

$$a^n = \underbrace{a \cdot a \cdot \ldots\ldots \cdot a}_{n}$$

$$\boxed{a^m \cdot a^n = a^{n+m}}$$

$$a^2 \cdot a^3 = a^5$$

$$\boxed{\left(a^m\right)^n = a^{m \cdot n}}$$

$$\left(a^2\right)^3 = a^6$$

$$\boxed{a^0 = 1}$$

$$a^m \cdot a^0 = a^{m+0} = a^m$$

$$\boxed{a^{-n} = \frac{1}{a^n}}$$

$$a^n \cdot a^{-n} = a^{n-n} = a^0 = 1$$

$$\sqrt{25} = 5 \qquad \sqrt{16} = 4 \qquad \sqrt{64} = 8$$

$$\sqrt[4]{16} = 2 \qquad \sqrt[6]{64} = 2 \qquad \sqrt[3]{64} = 4$$

$$\boxed{\sqrt[n]{a} = b \mid b^n = a}$$

$$\left(a^{\frac{m}{n}}\right)^n = a^m$$

$$\boxed{a^{\frac{m}{n}} = \sqrt[n]{a^m}}$$

$\log_5 25 = 2 \qquad \log_4 16 = 2 \qquad \log_8 64 = 2$

$\log_2 16 = 4 \qquad \log_2 64 = 6 \qquad \log_4 64 = 3$

$$\log_a b = c \quad | \quad a^c = b$$

$$a^{\log_a b} = b$$

$$\log_a bc = \log_a b + \log_a c$$

$a^{\log_a bc} = bc \;; \qquad a^{\log_a b + \log_a c} = a^{\log_a b} \cdot a^{\log_a c} = bc$

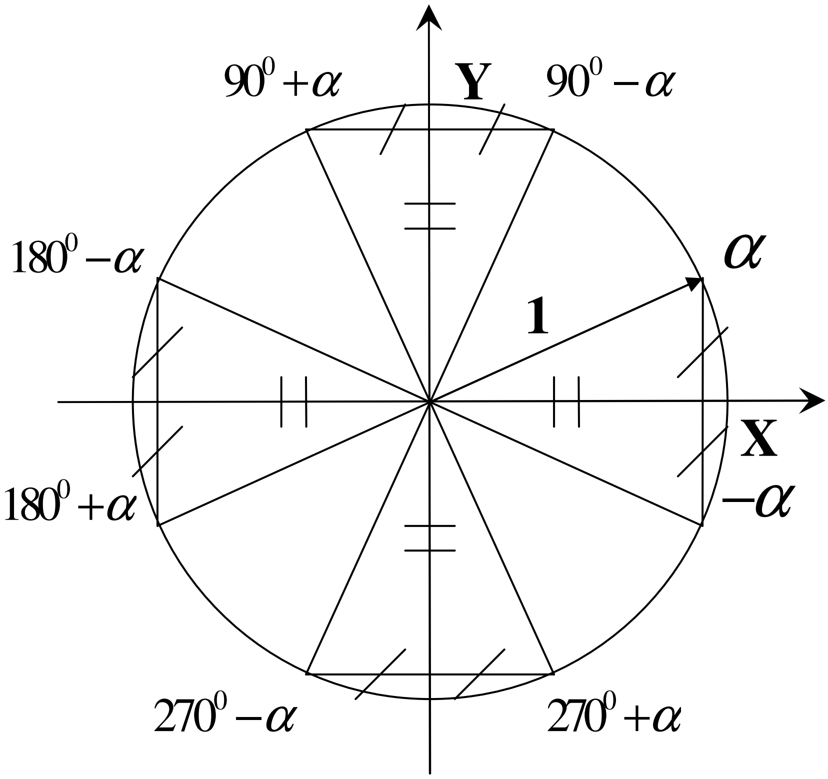
$$\log_a b^{\alpha} = \alpha \log_a b$$

$a^{\log_a b} = b \;; \quad b^{\log_b c} = c \;; \quad a^{\log_a c} = c$

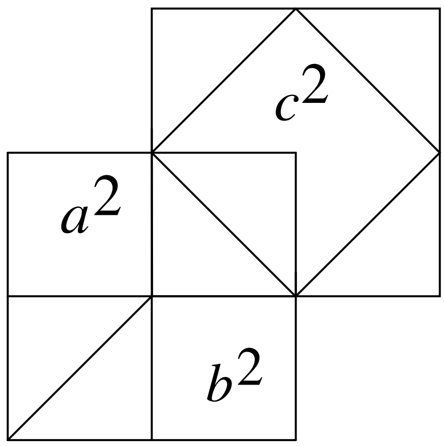
$a^{\log_a b^{\beta}} = b^{\beta} \;; \qquad a^{\beta \log_a b} = \left(a^{\log_a b}\right)^{\beta} = b^{\beta}$

$$\left(a^{\log_a b}\right)^{\log_b c} = c = a^{\log_a c}$$

$$\log_b c = \frac{\log_a c}{\log_a b}$$



$\sin(-\alpha) = -\sin\alpha$	$\cos(-\alpha) = \cos\alpha$
$\sin(90^0 - \alpha) = \cos\alpha$	$\cos(90^0 - \alpha) = \sin\alpha$
$\sin(90^0 + \alpha) = \cos\alpha$	$\cos(90^0 + \alpha) = -\sin\alpha$
$\sin(180^0 - \alpha) = \sin\alpha$	$\cos(180^0 - \alpha) = -\cos\alpha$
$\sin(180^0 + \alpha) = -\sin\alpha$	$\cos(180^0 + \alpha) = -\cos\alpha$
$\sin(270^0 - \alpha) = -\cos\alpha$	$\cos(270^0 - \alpha) = -\sin\alpha$
$\sin(270^0 + \alpha) = -\cos\alpha$	$\cos(270^0 + \alpha) = \sin\alpha$

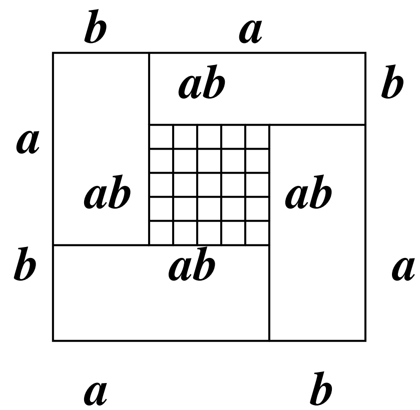


$$a^2+b^2=c^2$$

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

$$(a-b)^2=a^2-\underline{2ab}+b^2$$

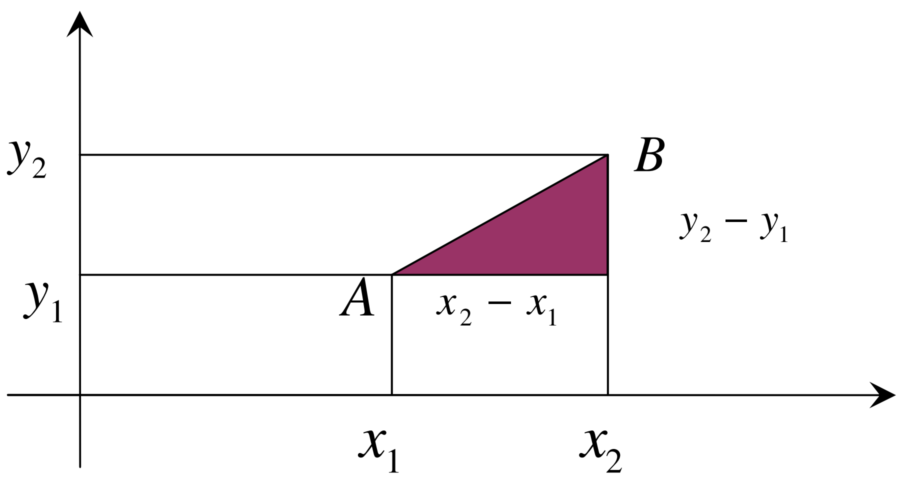
$$(a-b)^2=(a+b)^2-4ab=a^2+\underline{2ab}+b^2-\underline{4ab}$$

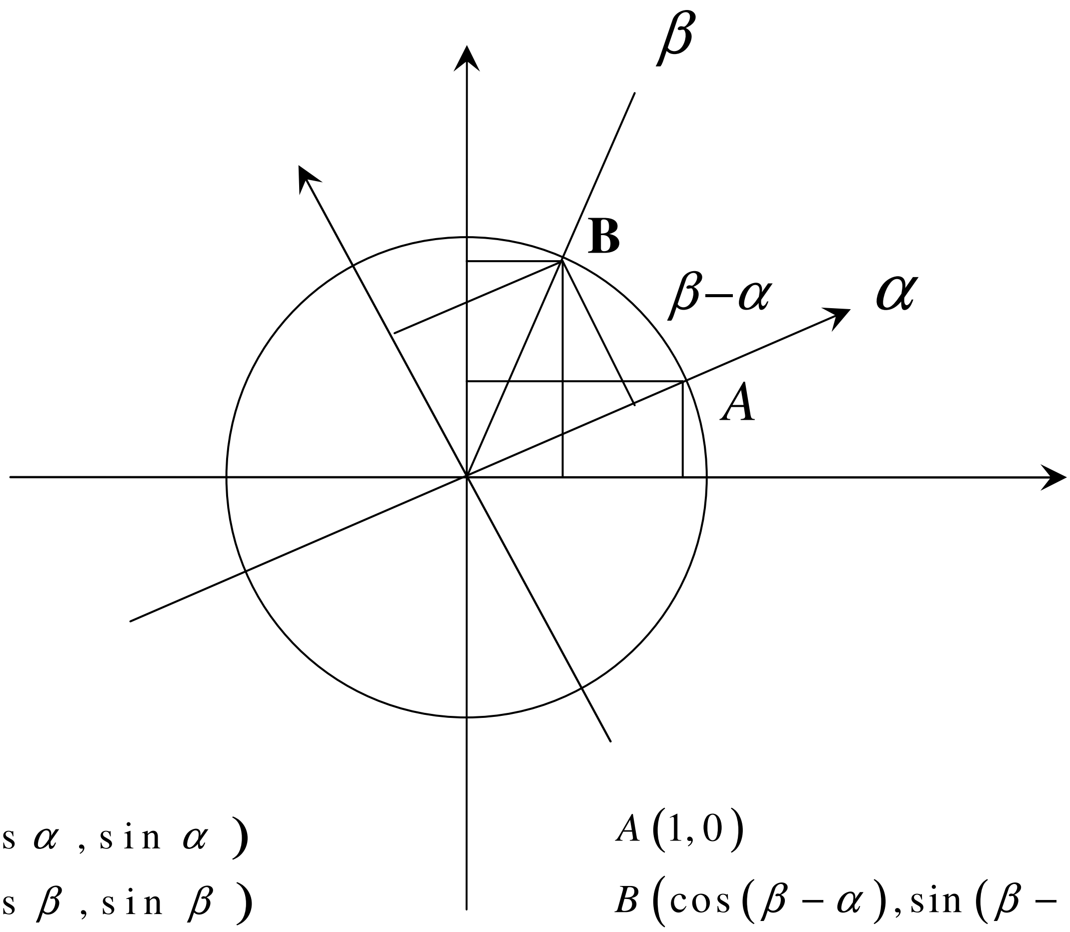


$A\ (x_1\,,\ y_1)$

$B\ (x_2\,,\ y_2)$

$$AB^2=(x_1-x_2)^2+(y_1-y_2)^2$$





$A(\cos\alpha, \sin\alpha)$

$B(\cos\beta, \sin\beta)$

$A(1,0)$

$B(\cos(\beta-\alpha), \sin(\beta-\alpha))$

$$AB^2 = (\cos\beta - \cos\alpha)^2 + (\sin\beta - \sin\alpha)^2 =$$
$$= \underline{\cos^2\beta} - 2\cos\beta\cos\alpha + \underline{\underline{\cos^2\alpha}} +$$
$$+ \underline{\sin^2\beta} - 2\sin\beta\sin\alpha + \underline{\underline{\sin^2\alpha}} =$$
$$= \underline{2 - 2(\cos\beta\cos\alpha + \sin\beta\sin\alpha)}$$

$$AB^2 = (\cos(\beta-\alpha) - 1)^2 + (\sin(\beta-\alpha) - 0)^2 =$$
$$= \underline{\cos^2(\beta-\alpha)} - 2\cos(\beta-\alpha) + 1 + \underline{\sin^2(\beta-\alpha)} =$$
$$= \underline{2 - 2\cos(\beta-\alpha)}$$

$$2 - \underline{2\cos(\beta-\alpha)} = 2 - \underline{2(\cos\beta\cos\alpha + \sin\beta\sin\alpha)}$$

$$\boxed{\cos(\beta-\alpha) = \cos\beta\cos\alpha + \sin\beta\sin\alpha}$$

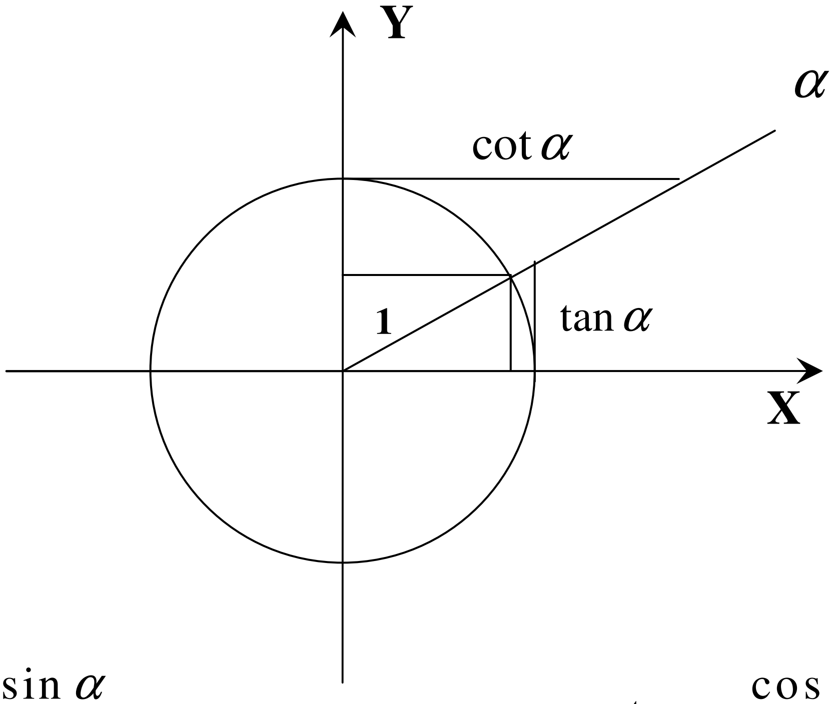
$$\sin(\beta+\alpha)=\sin\beta\cos\alpha+\sin\alpha\cos\beta$$
$$\sin(\beta-\alpha)=\sin\beta\cos\alpha-\sin\alpha\cos\beta$$
$$\cos(\beta+\alpha)=\cos\beta\cos\alpha-\sin\beta\sin\alpha$$
$$\cos(\beta-\alpha)=\cos\beta\cos\alpha+\sin\beta\sin\alpha$$

$$\sin\alpha=\sin\left(90^0-\alpha\right)$$
$$\sin(\alpha+\beta)=\cos\left(90^0-(\beta+\alpha)\right)=\cos\left(\left(90^0-\beta\right)-\alpha\right)=$$
$$=\cos\left(90^0-\beta\right)\cos\alpha+\sin\alpha\sin\left(90^0-\beta\right)$$

$$\sin\left(\overbrace{\beta+\alpha}^{x}\right)+\sin\left(\overbrace{\beta-\alpha}^{x}\right)=2\sin\beta\cos\alpha$$
$$\sin(\beta+\alpha)-\sin(\beta-\alpha)=2\sin\alpha\cos\beta$$
$$\cos(\beta+\alpha)+\cos(\beta-\alpha)=2\cos\alpha\cos\beta$$
$$\cos(\beta+\alpha)-\cos(\beta-\alpha)=-2\sin\alpha\sin\beta$$

$\beta+\alpha=x$ $\beta-\alpha=y$	$\beta=\dfrac{x+y}{2}$ $\qquad \alpha=\dfrac{x-y}{2}$

$$\sin x+\sin y=2\sin\frac{x+y}{2}\cdot\cos\frac{x-y}{2}$$
$$\sin x-\sin y=2\sin\frac{x-y}{2}\cdot\cos\frac{x+y}{2}$$
$$\cos x+\cos y=2\cos\frac{x+y}{2}\cdot\cos\frac{x-y}{2}$$
$$\cos x-\cos y=-2\sin\frac{x-y}{2}\cdot\sin\frac{x+y}{2}$$



$$\tan\alpha = \frac{\sin\alpha}{\cos\alpha} \qquad \cot\alpha = \frac{\cos\alpha}{\sin\alpha}$$

$$\boxed{\tan\alpha\cdot\cot\alpha = 1}$$

$$\tan^2\alpha + 1 = \frac{\sin^2\alpha}{\cos^2\alpha} + \frac{\cos^2\alpha}{\cos^2\alpha} = \frac{1}{\cos^2\alpha}$$

$$\cot^2\alpha + 1 = \frac{\cos^2\alpha}{\sin^2\alpha} + \frac{\sin^2\alpha}{\sin^2\alpha} = \frac{1}{\sin^2\alpha}$$

$$\boxed{\tan(\beta+\alpha)=\frac{\tan\beta+\tan\alpha}{1-\tan\beta\tan\beta}}$$

$$\frac{\sin(\beta+\alpha)}{\cos(\beta+\alpha)}=\frac{\sin\beta\cos\alpha+\sin\alpha\cos\beta}{\underline{\cos\beta\cos\alpha}-\sin\beta\sin\alpha}$$

$$\sin({}_{\alpha}\beta+\alpha)=\sin{}_{\alpha}\beta\cos\alpha+\sin\alpha\cos{}_{\alpha}\beta$$

$$\cos({}_{\alpha}\beta+\alpha)=\cos{}_{\alpha}\beta\cos\alpha-\sin{}_{\alpha}\beta\sin\alpha$$

$$\tan({}_{\alpha}\beta+\alpha)=\frac{\tan{}_{\alpha}\beta+\tan\alpha}{1-\tan{}_{\alpha}\beta\tan\alpha}$$

$$\sin 2\alpha = 2\sin\alpha\cos\alpha$$

$$\cos 2\alpha = \cos^2\alpha-\sin^2\alpha$$

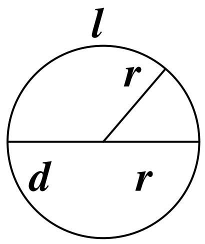
$$\tan 2\alpha = \frac{2\tan\alpha}{1-\tan^2\alpha}$$

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

$$\cos 2\alpha=\cos^2\alpha-\sin^2\alpha$$

$$1+\cos 2\alpha = 2\cos^2\alpha$$

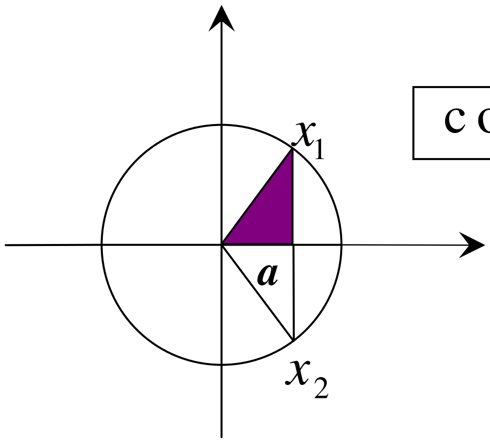
$$1-\cos 2\alpha = 2\sin^2\alpha$$



$$\frac{l}{d} = \pi = 3.1415926535 8\ldots$$
$$l = \pi d = 2\pi r$$

רדיאן

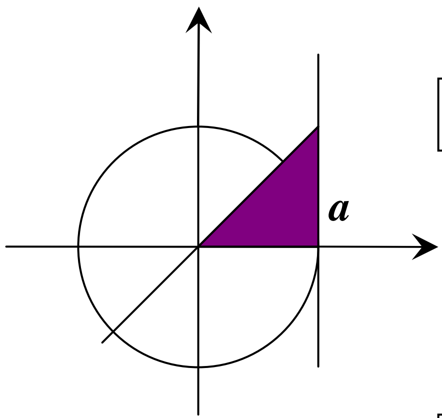
$2\pi \quad 360^0 \qquad \pi \quad 180^0 \qquad \frac{\pi}{2} \quad 90^0 \qquad \frac{\pi}{4} \quad 45^0 \qquad \frac{\pi}{3} \quad 60^0 \qquad \frac{\pi}{6} \quad 30^0$



$$\boxed{\cos x = a}$$

$$0 \le \arccos a \le \pi$$

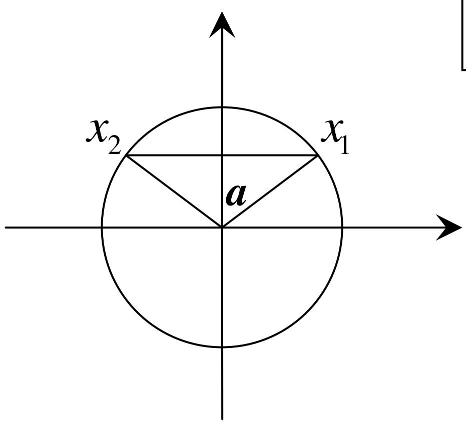
$$\boxed{x = \pm \arccos a + 2\pi k}$$



$$\boxed{\tan x = a}$$

$$-\frac{\pi}{2} < \arctan a < \frac{\pi}{2}$$

$$\boxed{x = \arctan a + \pi k}$$



$$\boxed{\sin x = a}$$

$$-\frac{\pi}{2} \le \arcsin a \le \frac{\pi}{2}$$

$$x_1 = \arcsin a + 2\pi k$$

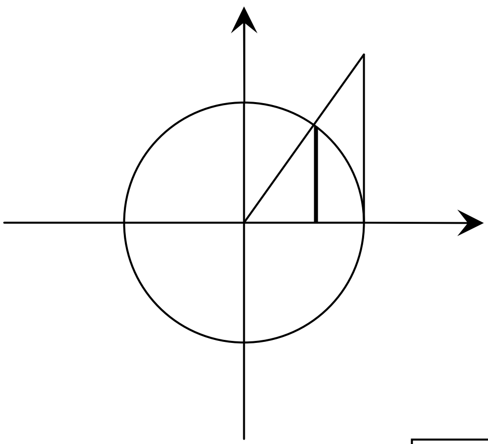
$$x_2 = \pi - \arcsin a + 2\pi k = -\arcsin a + \pi(2k+1)$$

$$\boxed{x = (-1)^n \arcsin a + \pi n}$$

$$f^{'}(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$$

t $\quad s(t) \quad v(t) \quad v=\frac{s}{t}$

$$s^{'}(t)=\lim_{h\to 0}\frac{s(t+h)-s(t)}{h}=v(t)$$



$$\lim_{x\to 0}\frac{\sin x}{x}=1$$

$$\sin x < x < \tan x = \frac{\sin x}{\cos x}$$

$$1 < \frac{x}{\sin x} < \frac{1}{\cos x}$$

$$\sin^{'} x = \cos x$$

$$\sin x - \sin y = 2\sin\frac{x-y}{2}\cos\frac{x+y}{2}$$

$$\sin^{'} x = \lim_{h\to 0}\frac{\sin(x+h)-\sin(x)}{h}=\lim_{h\to 0}\frac{\cancel{2}\cancel{\sin\frac{h}{2}}\cos\left(x+\frac{h}{2}\right)}{\cancel{2}\cancel{\frac{h}{2}}}=\cos x$$

$$\cos^{'} x = -\sin x$$

$$\cos x - \cos y = -2\sin\frac{x-y}{2}\sin\frac{x+y}{2}$$

$$\cos^{'} x = \lim_{h\to 0}\frac{\cos(x+h)-\cos(x)}{h}=\lim_{h\to 0}\frac{-\cancel{2}\cancel{\sin\frac{h}{2}}\sin\left(x+\frac{h}{2}\right)}{\cancel{2}\cancel{\frac{h}{2}}}=-\sin x$$

$$\boxed{(uv)' = u'v + uv'}$$

$$\lim_{h \to 0} \frac{u(x+h)\underline{v(x+h)} - u(x)\underline{v(x+h)} + \underline{\underline{u(x)}}v(x+h) - \underline{\underline{u(x)}}v(x)}{h} =$$

$$= u'(x)v(x) + u(x)v'(x)$$

$$f = \frac{u}{v} \qquad\qquad \boxed{\left(\frac{u}{v}\right)' = \frac{u'v - uv'}{v^2}}$$

$$u' = (fv)' = \underline{f'v} + fv'$$

$$f'v = u' - fv' = u' - \frac{u}{v}v' = \frac{u'v - uv'}{v}$$

$$\boxed{\tan' x = \frac{1}{\cos^2 x}}$$

$$\left(\frac{\sin x}{\cos x}\right)' = \frac{\sin' x \cos x - \sin x \cos' x}{\cos x^2} = \frac{\cos^2 x + \sin^2 x}{\cos x^2} = \frac{1}{\cos x^2}$$

$$\boxed{\cot' x = -\frac{1}{\sin^2 x}}$$

$$\left(\frac{\cos x}{\sin x}\right)' = \frac{\cos' x \sin x - \cos x \sin' x}{\sin x^2} = \frac{-\sin^2 x - \cos^2 x}{\sin x^2} = -\frac{1}{\sin x^2}$$

$$e = \lim_{y \to \infty} \left(1 + \frac{1}{y} \right)^{y} = 2.718281828459045\ldots$$

$$\log_e = \ln \qquad \boxed{\lim_{x \to 0} \frac{\ln(1+x)}{x} = 1} \qquad y = \frac{1}{x}$$

$$\lim_{y \to \infty} y \ln \left(1 + \frac{1}{y} \right) = \lim_{y \to \infty} \ln \left(1 + \frac{1}{y} \right)^{y} = \ln e = \log_e e = 1$$

$$\boxed{\ln' x = \frac{1}{x}}$$

$$\ln' x = \lim_{h \to 0} \frac{\ln(x+h) - \ln x}{h} = \lim_{h \to 0} \frac{\overbrace{\ln\left(1 + \frac{h}{x}\right)}^{1}}{\frac{h}{x} \cdot x} = \frac{1}{x}$$

$$\boxed{(\log_a x)' = \frac{1}{x \ln a}}$$

$$\left(\log_b c = \frac{\log_a c}{\log_a b} \right) \qquad (\log_a x)' = \left(\frac{\log_e x}{\log_e a} \right)' = \left(\frac{\ln x}{\ln a} \right)' = \frac{1}{x \ln a}$$

$$\boxed{\left(u\left(v\left(x\right)\right)\right)' = u'\left(v\left(x\right)\right)\cdot v'\left(x\right)}$$

$$\lim_{h\to 0}\frac{u\left(\overbrace{v\left(x+h\right)}^{y+t}\right)-u\left(\overbrace{v\left(x\right)}^{y}\right)}{h}\cdot\frac{v\left(x+h\right)-v\left(x\right)}{\underbrace{v\left(x+h\right)-v\left(x\right)}_{t}}=$$

$$=v'\left(x\right)\lim_{t\to 0}\frac{u\left(y+t\right)-u\left(y\right)}{t}=v'\left(x\right)\cdot u'\left(y\right)$$

$$\left(x\right)'=1 \qquad\qquad f'\left(x\right)=\lim_{h\to 0}\frac{f\left(x+h\right)-f\left(x\right)}{h}$$

$$\boxed{\arcsin' x=\frac{1}{\sqrt{1-x^2}}}$$

$$\sin\left(\arcsin x\right)=x$$

$$\sin'\left(\arcsin x\right)\cdot\arcsin' x=1$$

$$\cos\left(\arcsin x\right)\cdot\arcsin' x=1$$

$$\sqrt{1-x^2}\cdot\underline{\arcsin' x}=1$$

$$\boxed{\arccos' x=-\frac{1}{\sqrt{1-x^2}}}$$

$$\cos\left(\arccos x\right)=x$$

$$\cos'\left(\arccos x\right)\cdot\arccos' x=1$$

$$-\sin\left(\arccos x\right)\cdot\arccos' x=1$$

$$-\sqrt{1-x^2}\cdot\underline{\arccos' x}=1$$

$$\boxed{\arctan' x = \frac{1}{x^2+1}}$$

$$\tan(\arctan x) = x$$

$$\tan'(\arctan x)\cdot \arctan' x = 1$$

$$\frac{1}{\cos^2(\arctan x)}\cdot \arctan' x = 1$$

$$\left(\tan^2(\arctan x)+1\right)\cdot \arctan' x = 1$$

$$(x^2+1)\cdot \underline{\arctan' x} = 1$$

$$\boxed{\left(a^x\right)' = a^x \cdot \ln a}$$

$$\ln\left(a^x\right) = x\ln a$$

$$\ln'\left(a^x\right)\cdot\left(a^x\right)' = \ln a$$

$$\frac{1}{a^x}\cdot\left(a^x\right)' = \ln a$$

$$\boxed{\left(e^x\right)' = e^x}$$

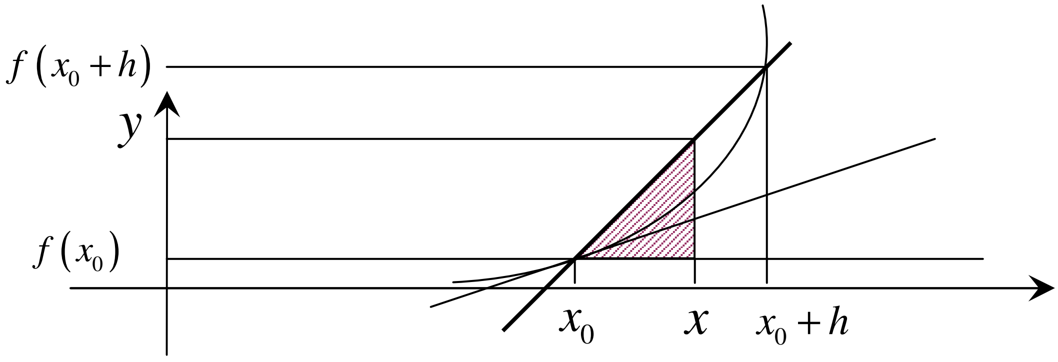
$$\boxed{\left(x^\alpha\right)' = \alpha \cdot x^{\alpha-1}}$$

$$\ln\left(x^\alpha\right) = \alpha \ln x$$

$$\ln'\left(x^\alpha\right)\cdot\left(x^\alpha\right)' = a \ln' x$$

$$\frac{1}{x^\alpha}\cdot\left(x^\alpha\right)' = \frac{\alpha}{x}$$

$$\left(x^\alpha\right)' = x^\alpha\cdot\frac{\alpha}{x} = \alpha x^{\alpha-1}$$



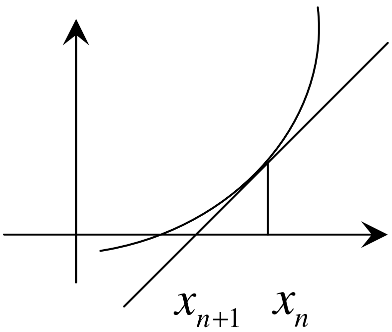
$$\frac{y-f(x_0)}{x-x_0}=\frac{f(x_0+h)-f(x_0)}{h}\to f'(x_0)$$

משיק

$$\boxed{y-f(x_0)=f'(x_0)(x-x_0)}$$

שיטת ניוטון (1643-1727)

$$\boxed{f(x)=0}$$



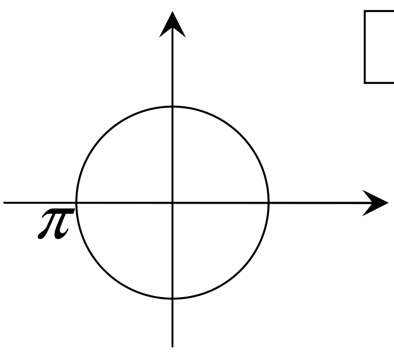
$$y-f(x_n)=f'(x_n)(x-x_n)$$

$$-f(x_n)=f'(x_n)(x_{n+1}-x_n)$$

$$x_{n+1}-x_n=-\frac{f(x_n)}{f'(x_n)}$$

$$\boxed{x_{n+1}=x_n-\frac{f(x_n)}{f'(x_n)}}$$

$$\pi=3.14159265358979323846\ldots$$



$$\boxed{\sin x=0}$$

$$x_{n+1}=x_n-\frac{\sin x_n}{\cos x_n}=x_n-\tan x_n$$

$x_1=3$ $\qquad$ $x_2=3-\tan 3=3.14$

$x_3=3.14-\tan 3.14=3.14159265$

$$x^2 + px + q = 0$$

$$x_{1,2} = -\frac{p}{2} \pm \sqrt{\frac{p^2}{4} - q}$$

$$x^2 + 2\frac{p}{2}x + \left(\frac{p}{2}\right)^2 = \left(\frac{p}{2}\right)^2 - q$$

$$\left(x + \frac{p}{2}\right)^2 = \frac{p^2}{4} - q \; ; \; x + \frac{p}{2} = \pm\sqrt{\frac{p^2}{4} - q}$$

$$ax^2 + bx + c = 0$$

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x^2 + \frac{b}{a}x + \frac{c}{a} = 0$$

$$\begin{matrix} & p & & q \end{matrix}$$

$$x_{1,2} = -\frac{b}{2a} \pm \sqrt{\frac{b^2}{4a^2} - \frac{c}{a}} = -\frac{b}{2a} \pm \sqrt{\frac{b^2 - 4ac}{4a^2}}$$

$$(a+b)\cdot(a-b) = a^2 - b^2$$

$$x_1 = -\frac{p}{2} + \sqrt{\frac{p^2}{4} - q}$$

$$x_2 = -\frac{p}{2} - \sqrt{\frac{p^2}{4} - q}$$

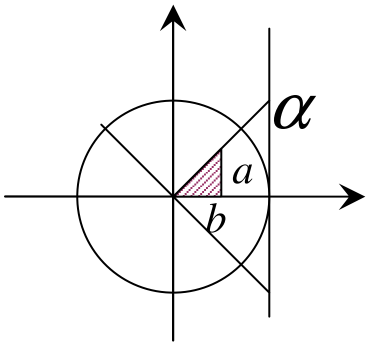
$$a^2 = \frac{p^2}{4}$$

$$b^2 = \frac{p^2}{4} - q$$

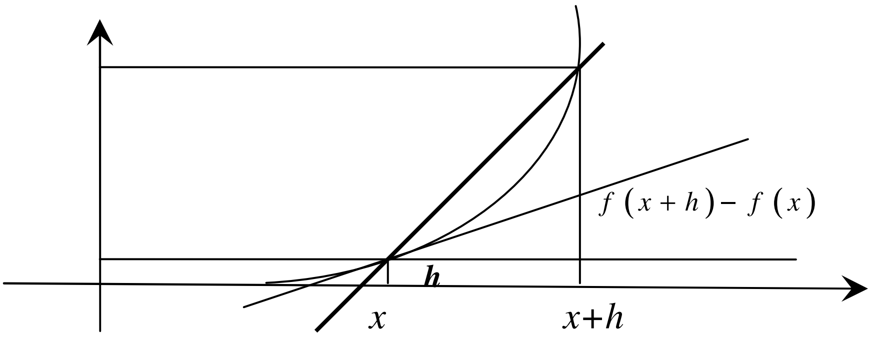
ויאטה (1540 - 1603)

$$x_1 + x_2 = -p = -\frac{b}{a}$$

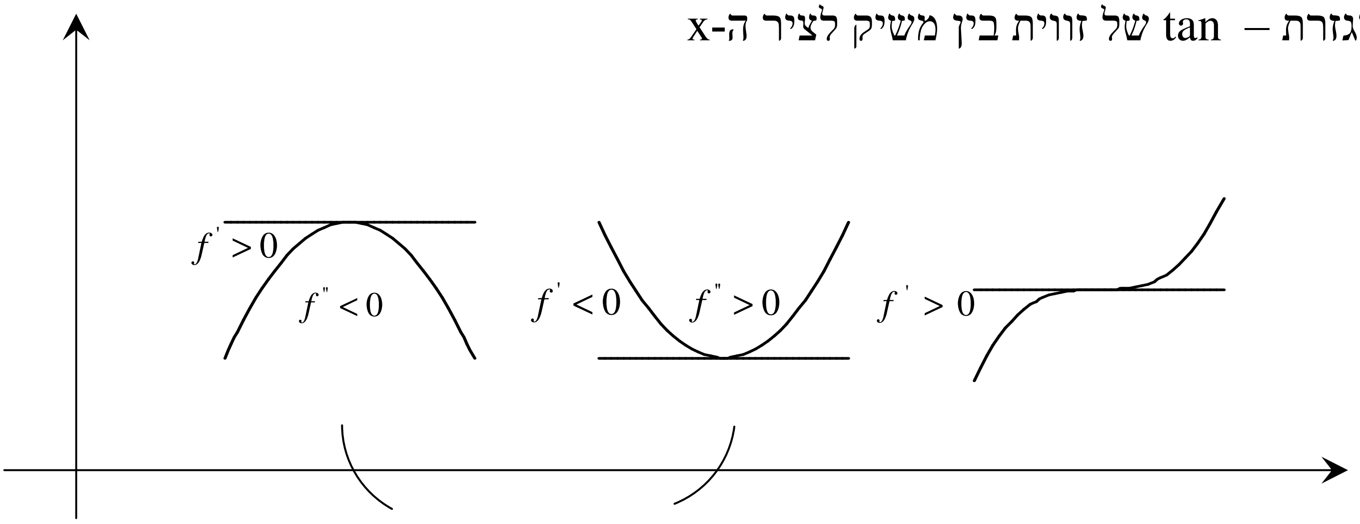
$$x_1 \cdot x_2 = q = \frac{c}{a}$$



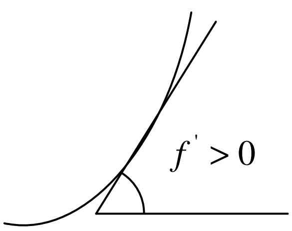
$$\tan\alpha = \frac{a}{b}; \qquad f'(x) = \lim_{h\to 0}\frac{f(x+h) - f(x)}{h}$$

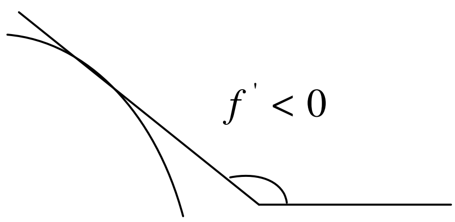


ניגזרת – tan של זווית בין משיק לציר ה-x



$$\boxed{f' = 0}$$





$g'(x) = f(x)$

$$\boxed{\int f(x)dx = g(x) + c}$$

$$\int \cos x \, dx = \sin x + c$$

$$\int \sin x \, dx = -\cos x + c$$

$$\int \frac{1}{\cos^2 x} dx = \tan x + c$$

$$\int \frac{1}{\sin^2 x} dx = -\cot x + c$$

$$\int \frac{1}{\sqrt{1 - x^2}} dx = \arcsin x + c$$

$$\int \frac{1}{x^2 + 1} dx = \arctan x + c$$

$$\int 1 \, dx = x + c$$

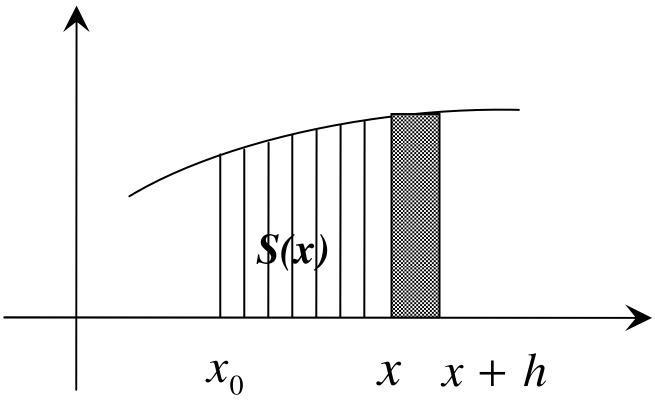
$$\int x \, dx = \frac{x^2}{2} + c$$

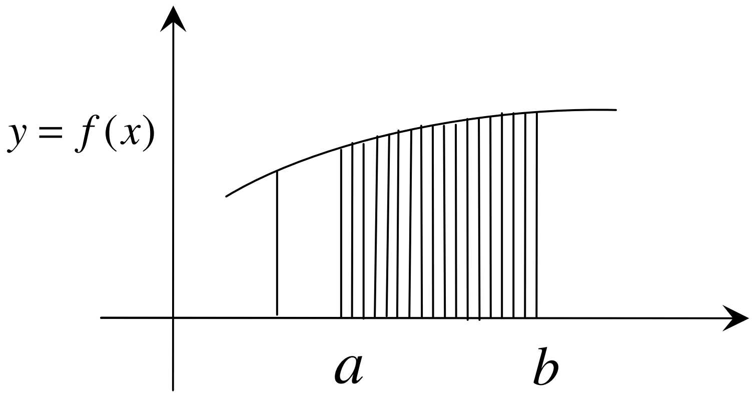
$$\int x^2 \, dx = \frac{x^3}{3} + c$$

$$\int x^\alpha \, dx = \frac{x^{\alpha+1}}{\alpha + 1} + c \qquad \alpha \neq -1$$

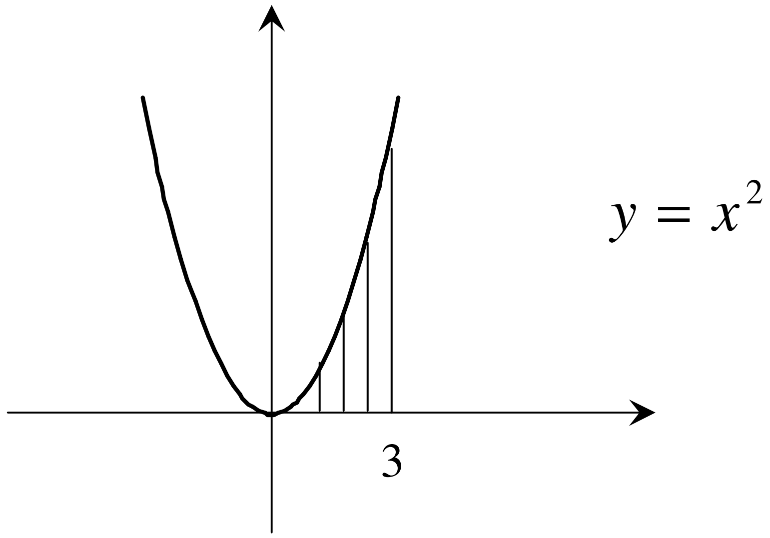
$$\int x^{-1} \, dx = \int \frac{1}{x} dx = \ln x + c$$

$$\int_a^b f(x)\,dx = g(b) - g(a)\,|_a^b$$

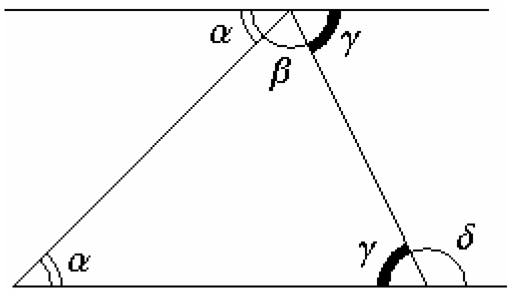




$$s'(x) = \lim_{h \to 0} \frac{s(x+h) - s(x)}{h} = f(x)$$

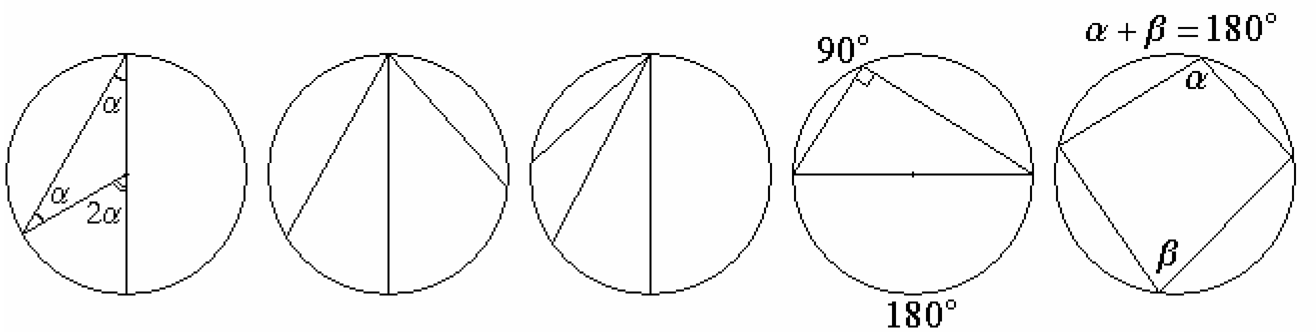


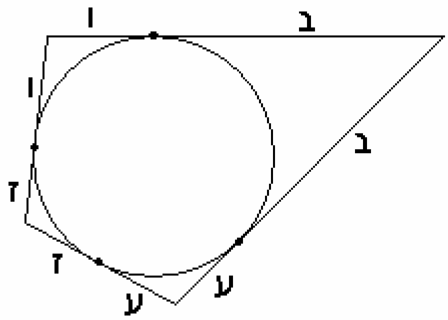
$$\int_0^3 x^2\,dx = \frac{x^3}{3}\,|_0^3 = \frac{3^3}{3} - \frac{0^3}{3} = 9$$

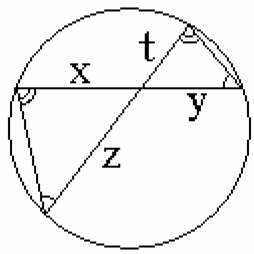


$\alpha + \beta + \gamma = 180^{o} = \delta + \gamma$

$\alpha + \beta = \delta$

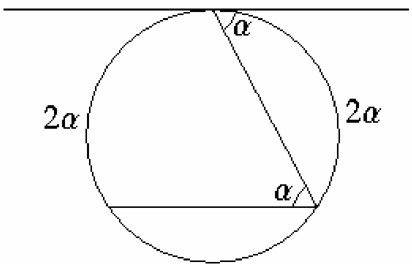


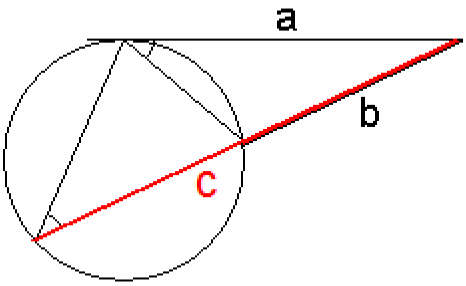




$$\frac{x}{z} = \frac{t}{y}$$

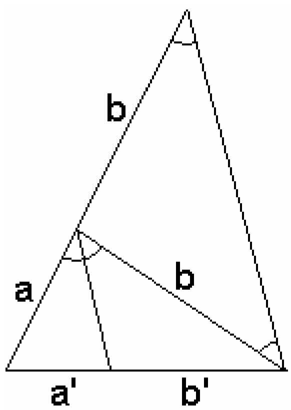
$$xy = zt$$





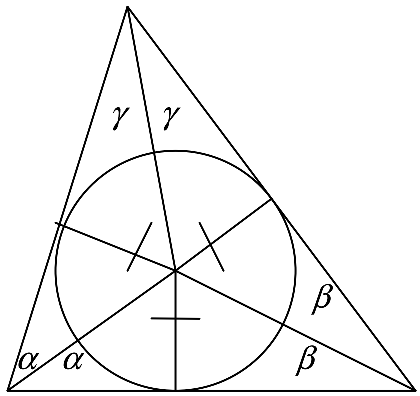
$$\frac{a}{b} = \frac{c}{a}$$

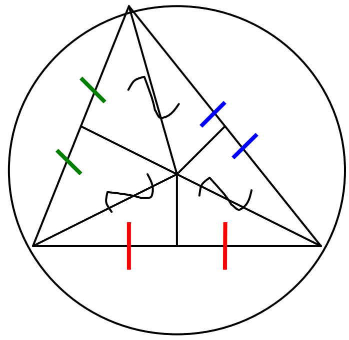
$$a^2 = bc$$

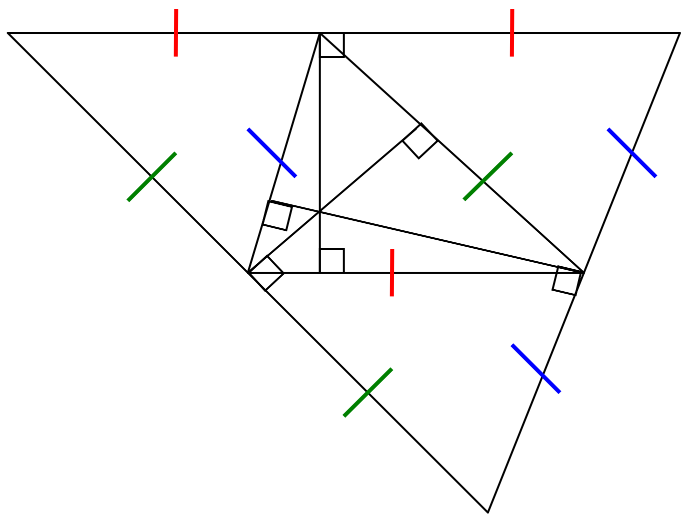


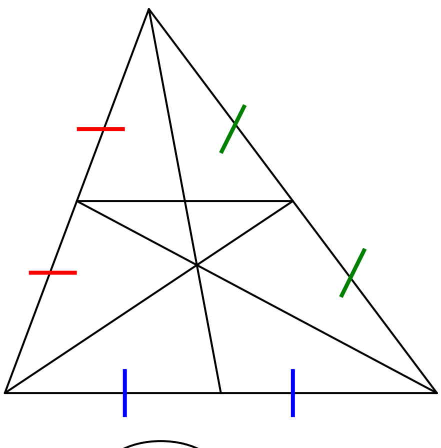
$$\frac{a'}{b'} = \frac{a}{b}$$

$$a^2 = bc$$



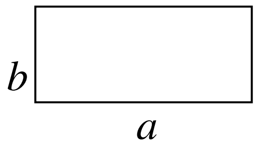




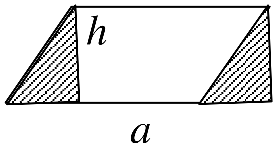


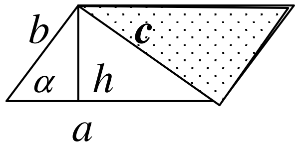
1:2

$S = ab$



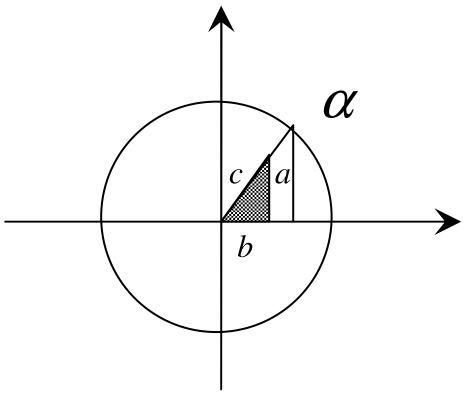
$S = ah$





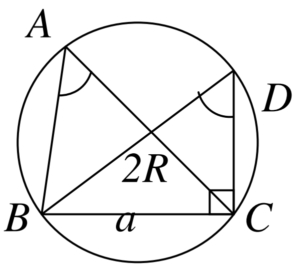
$\frac{h}{b} = \sin\alpha = \frac{c}{2R}$

$$S = \frac{ah}{2} = \frac{ab\sin\alpha}{2} = \frac{abc}{4R} = rp$$



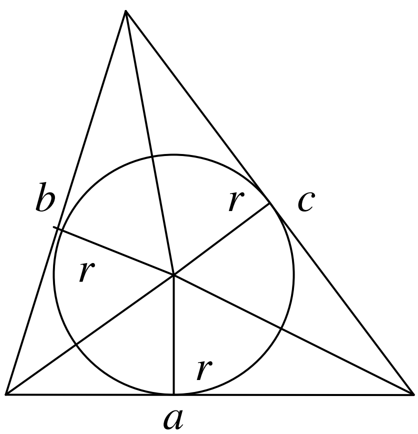
$\sin\alpha = \frac{a}{c}\ ;\ \cos\alpha = \frac{b}{c}$

משפט הסינוסים

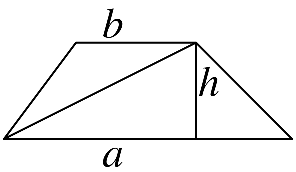


$$\sin A = \sin D = \frac{a}{2R}$$

$$2R = \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

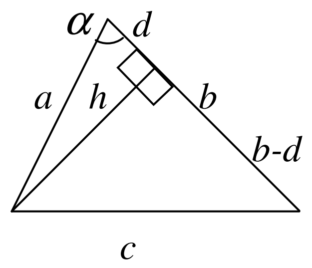


$$\frac{ar}{2} + \frac{br}{2} + \frac{cr}{2} = r\frac{a+b+c}{2} = rp$$



$$\frac{ah}{2} + \frac{bh}{2} = h\frac{a+b}{2}$$

משפט הקוסינוסים



$$c^2 = h^2 + (b-d)^2 = \underline{h}^2 + \underline{\underline{b}}^2 - 2bd + \underline{d}^2$$

$$\boxed{c^2 = \underline{a}^2 + \underline{\underline{b}}^2 - 2ab\cos\alpha}$$

$$\boxed{\cos\alpha = \frac{a^2 + b^2 - c^2}{2ab}}$$

משפט הירון

$$\boxed{S = \sqrt{p\cdot(p-a)\cdot(p-b)\cdot(p-c)}}$$

$$\frac{ab\sin\alpha}{2} = \frac{ab}{2}\sqrt{1-\cos^2\alpha} = \frac{\cancel{ab}}{2}\sqrt{\frac{(2ab)^2 - (a^2+b^2-c^2)^2}{(2\cancel{ab})^2}} =$$

$$= \sqrt{\frac{(2ab + a^2 + b^2 - c^2)(2ab - a^2 - b^2 + c^2)}{4\cdot 4}} =$$

$$= \sqrt{\frac{\left((a+b)^2 - c^2\right)\left(c^2 - (a-b)^2\right)}{4\cdot 4}} =$$

$$= \sqrt{\frac{(a+b+c)\cdot(a+b-c)\cdot(c+a-b)\cdot(c-a+b)}{2\cdot 2\cdot 2\cdot 2}} =$$

$$= \sqrt{p\cdot(p-c)\cdot(p-b)\cdot(p-a)}$$

$$p - c = \frac{a+b+c}{2} - \frac{2c}{2} = \frac{a+b-c}{2}$$

אינדוקציה

$$\left(p(1),\ p(n) \to p(n+1)\right) \to p(n)\ \forall\ n$$

$$1+\ldots\ldots+n=\frac{n(n+1)}{2} \qquad 1=\frac{1\cdot 2}{2}$$

$$\frac{n\cancel{(n+1)}}{2}+\cancel{(n+1)}_1=\frac{\cancel{(n+1)}(n+2)}{2} \quad ; \quad n+2=n+2$$

$$1^2+\ldots\ldots+n^2=\frac{n(n+1)(2n+1)}{6} \qquad 1^2=\frac{1\cdot 2\cdot 3}{6}$$

$$\frac{n\cancel{(n+1)}(2n+1)}{6}+(n+1)^{\cancel{2}}=\frac{\cancel{(n+1)}(n+2)(2n+3)}{6}$$

$$\underline{\underline{2n^2}}+n+6n+\underline{6}=\underline{\underline{2n^2}}+4n+3n+\underline{6}$$

$$1^3+\ldots\ldots+n^3=\frac{n^2(n+1)^2}{4} \qquad 1^3=\frac{1^2\cdot 2^2}{4}$$

$$\frac{n^2\cancel{(n+1)^2}}{4}+(n+1)^{\cancel{3}}=\frac{\cancel{(n+1)^2}(n+2)^2}{4}$$

$$n^2+4n+4=n^2+4n+4$$

קומבינטוריקה

$$P_n = n!$$ $$n \cdot (n-1) \cdot (n-2) \cdot \ldots\ldots \cdot 1$$

$$A_n^m = \frac{n!}{(n-m)!}$$ $$n \cdot (n-1)(n-2) \cdot \ldots \cdot (n-(m-1)) \frac{(n-m)!}{(n-m)!}$$

$$C_n^m = \frac{n!}{m!(n-m)!}$$

משולש פסקל (1623-1662)

1

1 1

1 2 1

1 3 3 1

1 4 6 4 1

1 5 10 10 5 1

1 6 15 20 15 6 1

1 7 21 35 35 21 7 1

בינום ניוטון (1643-1727)

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

$$(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$$

$$(a+b)^5 = a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$$

$$(a+b)^6 = a^6 + 6a^5b + 15a^4b^2 + 20a^3b^3 + 15a^2b^4 + 6ab^5 + b^6$$

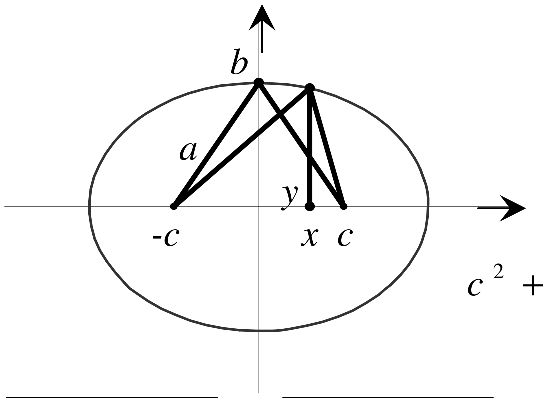
$$(a+b)^7 = a^7 + 7a^6b + 21a^5b^2 + 35a^4b^3 + 35a^3b^4 + 21a^2b^5 + 7ab^6 + b^7$$

$$(a+b)^n = \underbrace{(a+b)\cdot\ldots\ldots\cdot(a+b)}_{n} = \sum_{m=0}^{n} C_n^m \cdot a^m \cdot b^{n-m}$$

$a - 1 + a + 1 = 2a$

אליפסה

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$



$$c^2 + b^2 = a^2$$

$$\sqrt{(x+c)^2 + y^2} + \sqrt{(x-c)^2 + y^2} = 2a$$

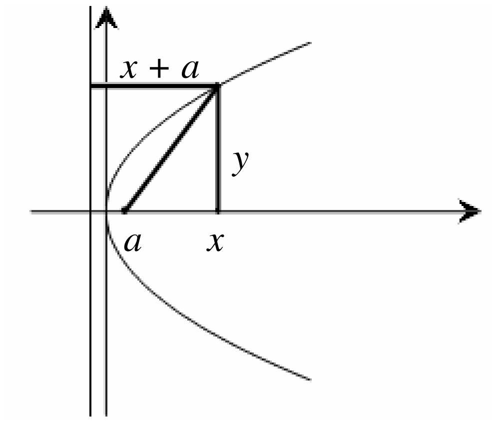
$$x^2 + 2\cancel{xc} + c^2 + y^2 \cancel{+x^2} - \cancel{2xc} + \cancel{c^2} + \cancel{y^2} + \cancel{2}\sqrt{\left(x^2 - c^2\right)^2 + y^4 + y^2\left(2x^2 + 2c^2\right)} = 2\cancel{4}a^2$$

$$\cancel{x^4} - 2x^2c^2 + c^4 + \cancel{y^4} + \cancel{2x^2y^2} + 2y^2c^2 = \left(\left(c^2 + b^2\right) - \left(x^2 + y^2\right)\right)^2 =$$

$$= \left(a^2 + b^2\right)^2 - 2\left(a^2 + b^2\right)\left(x^2 + y^2\right) + \cancel{x^4} + \cancel{2x^2y^2} + \cancel{y^4}$$

$$2x^2\left(a^2 + b^2 - c^2\right) + 2y^2\left(a^2 + b^2 + c^2\right) = \left(a^2 + b^2 - c^2\right)\cdot\left(a^2 + b^2 + c^2\right)$$

$$2x^2 \cdot 2b^2 + 2y^2 \cdot 2a^2 = \underline{2b^2 \cdot 2a^2}$$

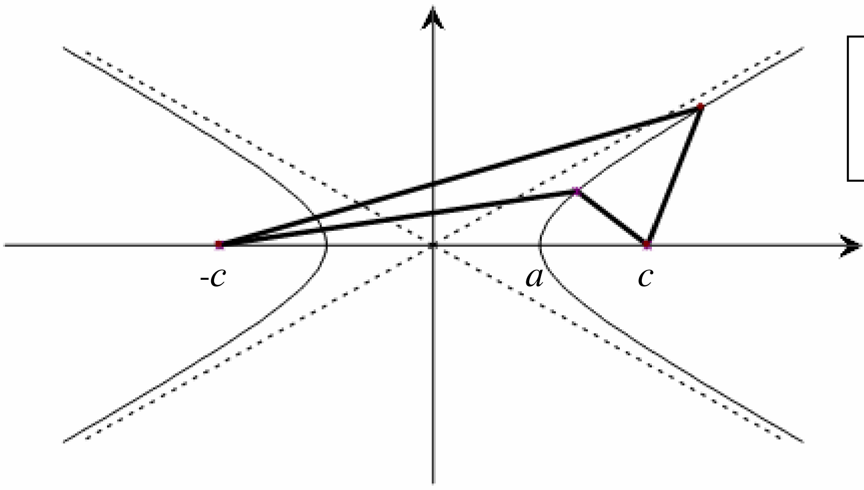


$$(x-a)^2 + y^2 = (x+a)^2$$

$$x^2 - 2ax + a^2 + y^2 = x^2 + 2ax + a^2$$

פרבולה

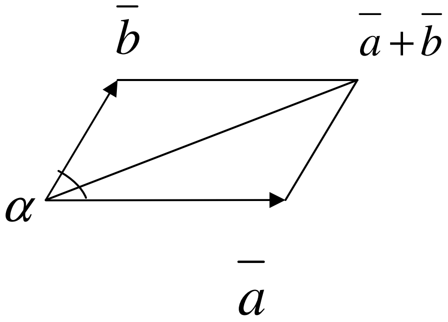
$$y^2 = 4ax$$



היפרבולה

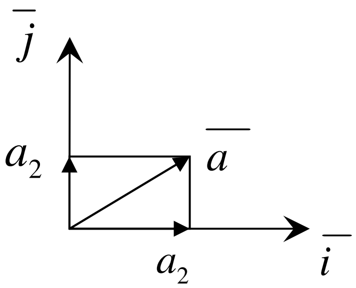
$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

$$b^2 = c^2 - a^2$$



$$\overline{a}\cdot\overline{b}=\left|\overline{a}\right|\left|\overline{b}\right|\cos\alpha$$

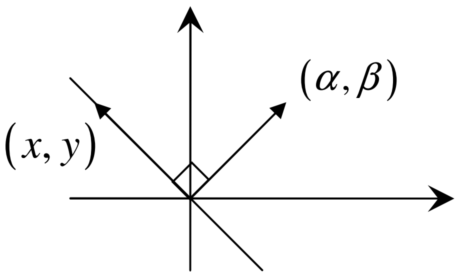
$$\overline{a}\left(\overline{b}+\overline{c}\right)=\overline{a}\cdot\overline{b}+\overline{a}\cdot\overline{c}\ \ ;\ \ \overline{a}\cdot\overline{b}=0\Leftrightarrow\overline{a}\perp\overline{b}$$



$$\left|\overline{i}\right|=\left|\overline{j}\right|=1 \qquad \overline{i}\perp\overline{j}$$

$$\overline{a}=a_1\overline{i}+a_2\overline{j}\quad;\quad\overline{b}=b_1\overline{i}+b_2\overline{j}$$

$$\boxed{\overline{a}\cdot\overline{b}=a_1\cdot b_1+a_2\cdot b_2}$$



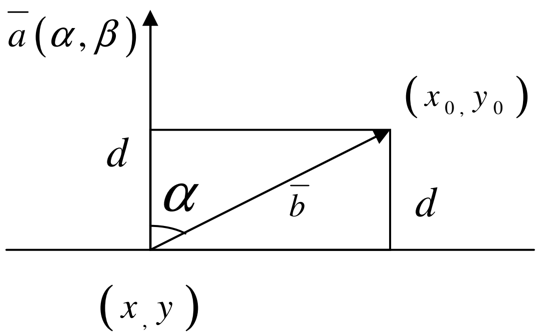
$$\boxed{\alpha x+\beta y=0}$$

$$\boxed{\alpha x+\beta y+\gamma=0}$$

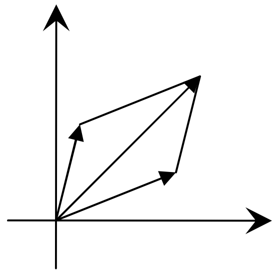
$$\boxed{d=\frac{\left|\alpha x_0+\beta y_0+\gamma\right|}{\sqrt{\alpha^2+\beta^2}}}$$

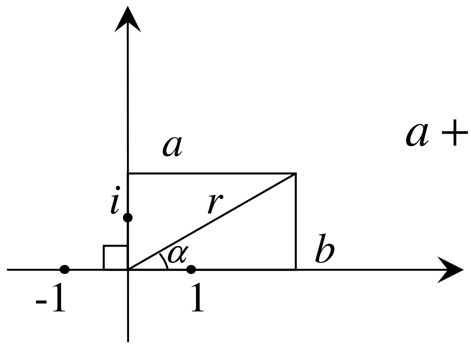
$$d=\left|\overline{b}\right|\cos\alpha=\cancel{\left|\overline{b}\right|}\frac{\overline{a}\cdot\overline{b}}{\left|\overline{a}\right|\cancel{\left|\overline{b}\right|}}=\frac{\alpha\left(x_0-x\right)+\beta\left(y_0-y\right)}{\sqrt{\alpha^2+\beta^2}}=$$

$$=\frac{\alpha x_0+\beta y_0+\gamma\cancel{-\alpha x-\beta y-\gamma}}{\sqrt{\alpha^2+\beta^2}}$$



$$\boxed{i^2=-1}$$





$$a+bi=r\left(\cos\alpha+i\sin\alpha\right)$$

$$\left(a+bi\right)+\left(c+di\right)=\left(a+c\right)+i\left(b+d\right)$$
$$\left(a+bi\right)\cdot\left(c+di\right)=\left(ac-bd\right)+i\left(ad+bc\right)$$

$$r\left(\cos\alpha+i\sin\alpha\right)\cdot t\left(\cos\beta+i\sin\beta\right)=$$
$$=rt\left(\left(\cos\beta\cos\alpha-\sin\beta\sin\alpha\right)+i\left(\sin\beta\cos\alpha+\sin\alpha\cos\beta\right)\right)=$$
$$=rt\left(\cos\left(\beta+\alpha\right)+i\sin\left(\beta+\alpha\right)\right)$$

$+\cdot+$	$+$
$+\cdot-$	$-$
$-\cdot+$	$-$
$-\cdot-$	$+$

<u>נוסחת דה - מואבר</u>

$$\left(r\left(\cos\alpha+i\sin\alpha\right)\right)^n=r^n\left(\cos n\alpha+i\sin n\alpha\right)$$

סידרה חשבונית

$$a_1 \qquad a_2 = a_1 + d \qquad a_3 = a_1 + 2d \qquad a_4 = a_1 + 3d$$

$$\boxed{a_n = a_1 + (n-1)d}$$

$$S_n = a_1 + a_2 + \ldots\ldots + a_n = \boxed{n a_1 + d\frac{(n-1)n}{2}}$$

סידרה הנדסית

$$b_1 \qquad b_2 = b_1 q \qquad b_3 = b_1 q^2 \qquad b_4 = b_1 q^3$$

$$\boxed{b_n = b_1 q^{n-1}}$$

$$S_n = b_1 + b_2 + \ldots\ldots + b_n = b_1\left(1 + q + q^2 + \ldots\ldots + q^{n-1}\right)\frac{q-1}{q-1} =$$

$$\boxed{= b_1 \frac{q^n - 1}{q - 1}} \qquad = b_1 \frac{1 - q^n}{1 - q}$$

$$-1 < q < 1$$

$$S_\infty = b_1 + b_2 + \ldots\ldots + b_n + \ldots = \boxed{b_1 \frac{1}{1 - q}}$$