$A = P(1+\frac{r}{n})^{nt}$

\$1000

After 4 years

Bank SL 3.5%
Compound yearly
\$1,147.52

Bank B 3.25%
compound daily
\$1,138.82

Bank of Dallas
3.5%
Compound daily
\$1,150.26

Bank of MO city
Continuous compount
$\lim_{N\to\infty} P(1+\frac{r}{N})^{t} = Pe^{rt}$
\$1,150.27

v.19

$\lim_{x\to\infty} (1+\frac{1}{x})^x = e$ - Known

$\lim_{N\to\infty} P(1+\frac{r}{n})^{nt}$

$P \lim_{N\to\infty} (1+\frac{r}{n})^{nt}$

$P \lim_{x\to\infty} (1+\frac{1}{x})^{rxt}$

$P\left[\lim_{x\to\infty} (1+\frac{1}{x})^{x}\right]^{rt}$

Pe^{rt}

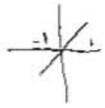
Inverse Trig

$y = \arcsin x = \sin^{-1} x$

$D: -1 \le x \le x$

$R: -\pi/2 \le x \le \frac{\pi}{2}$

$\sin(\arcsin x) = x$

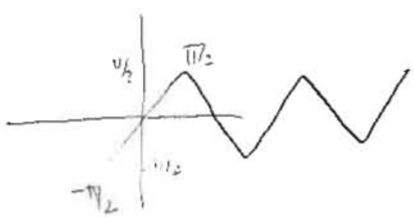


* true between -1 and 1

$\arcsin(\sin x) = x$

$\arcsin(\sin 2\pi/3) = \pi/3$

not $2\pi/3$



$\frac{d}{dx}\sin(\arcsin x) \quad \frac{d}{dx}x$

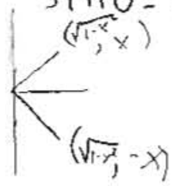
$\cos(\arcsin \quad) D_x \arcsin x = 1$

$D_x \arcsin x = \frac{1}{\cos(\arccos x)}$

$\cos(\arcsin x)$

$\arcsin x = \theta$

$\sin\theta = x$



$a^2 + x^2 = 1$

$a^2 = 1 - x^2$

$a = \sqrt{1-x^2}$

$\cos\theta \quad \sqrt{1-x^2}$

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

* chain rule applies

ex. $\frac{d}{dx}\arcsin e^x$

$= \frac{1\, e^x}{\sqrt{1-e^{2x}}}$

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

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

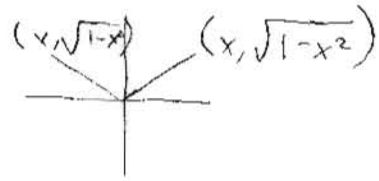
$\arccos x = y$

$\cos y = x$

$\frac{d}{dx}\cos y = \frac{d}{dx}x$

$-\sin y \frac{dy}{dx} = 1$

$\frac{dy}{dx} = \frac{-1}{\sin y}$



$D_x \operatorname{arccot} = \frac{-1}{1+x^2}$

$\arcsin x = -\arccos x + C$

$D_x \operatorname{arcsec} x = \frac{1}{|x|\sqrt{x^2-1}}$

$D_x \operatorname{arccsc} x = \frac{-1}{|x|\sqrt{x^2-1}}$

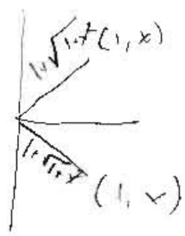
$y = \arctan x$

$\tan y = x$

$\sec^2 y \frac{dy}{dx} = 1$

$\frac{dy}{dx} = \frac{1}{\sec^2 y}$

$\frac{1}{1+y^2}$

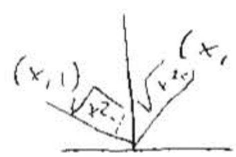


$y = \operatorname{arccot} x$

$\cot y = x$

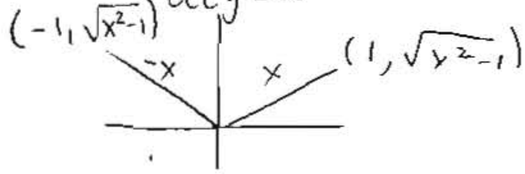
$-\csc^2 y \frac{dy}{dx} = 1$

$\frac{dy}{dx} = \frac{-1}{\csc^2 y}$



$y = \operatorname{arcsec} x$

$\sec y = x$



$\sec y \tan y \frac{dy}{dx} = 1$

$\frac{dy}{dx} = \frac{1}{x\sqrt{x^2-1}}$ or $\frac{1}{x(-\sqrt{x^2-1})}$

$\therefore \frac{1}{|x|\sqrt{x^2-1}}$ b/c $|x| \begin{cases} x & x>0 \\ -x & x<0 \end{cases}$

Integral Rules

$$\int \frac{dx}{\sqrt{a^2-x^2}}$$

$$\int \frac{dx}{a\sqrt{1-\frac{x^2}{a^2}}} \qquad u = \frac{x}{a} \quad du = \frac{1}{a}dx$$

$$\int \frac{du}{\sqrt{1-u^2}}$$

Arcsin $u + C$

Arcsin $\frac{x}{a} + C$

ex. $\int_0^3 \frac{dx}{\sqrt{9-x^2}}$

$= \arcsin\frac{x}{3} + C \Big]_0^3$

$= \arcsin 1 - \arcsin 0$

$\pi/2 - 0$

$= \pi/2$

$$\boxed{\int \frac{dx}{\sqrt{a^2-x^2}} = \arcsin\frac{x}{a} + C}$$

$$\int \frac{dx}{a^2+x^2}$$

$$\frac{1}{a^2}\int \frac{dx}{1+\frac{x^2}{a^2}}$$

$u = \frac{x}{a}$, $du = \frac{dx}{a}$

$$\frac{1}{a}\int \frac{1}{a}\left(\frac{dx}{1+\frac{x^2}{a^2}}\right)$$

$$\frac{1}{a}\int \frac{du}{1+u^2}$$

$= \frac{1}{a}\arctan u + C$

* be able to complete the square

Integral Rules

$$\int \frac{dx}{\sqrt{a^2-x^2}} = \arcsin\frac{x}{a} + C$$

$$\int \frac{dx}{a^2+x^2} = \frac{1}{a}\int \frac{du}{1+u^2}$$

$$\int \frac{dx}{x\sqrt{x^2-a^2}} = \frac{1}{a}\text{Arcsec}\frac{|x|}{a} + C$$

ex. $\frac{1}{2}\int \frac{dx}{4x^2+9}$

$= \frac{1}{2}\int \frac{2dx}{4x^2+9}$

$= \frac{1}{2}\left(\frac{1}{3}\right)\text{Arctan}\frac{2x}{3} + C$

$= \frac{1}{6}\text{Arctan}\frac{2x}{3} + C$

ex 2. $\int \frac{dx}{x^2-10x+26}$

$$\int \frac{dx}{x^2-10x+25-1}$$

$$\int \frac{dx}{(x-5)^2+1} \qquad u = x-5 \quad du = dx$$

Arctan $(x-5) + C$

$$\int \frac{dx}{x\sqrt{x^2-a^2}}$$

$$\int \frac{dx}{ax\sqrt{\left(\frac{x}{a}\right)^2-1}} \qquad u=\frac{x}{a} \quad du=\frac{1}{a}dx$$

$$x=au$$

$$\frac{1}{a}\int \frac{du}{u\sqrt{u^2-1}}$$

$$=\frac{1}{a}\operatorname{arcsec}|u|+C$$

$$=\frac{1}{a}\operatorname{arcsec}\frac{|x|}{a}+C$$