§10.5 #

$$\sum_{n=1}^{\infty} \frac{n^{\sqrt{2}}}{2^n}$$

$$|a_n|^{\frac{1}{n}} = \frac{\left(n^{\sqrt{2}}\right)^{\frac{1}{n}}}{2^{\frac{n}{n}}} = \frac{n^{\frac{\sqrt{2}}{n}}}{2} = \frac{1}{2} n^{\frac{\sqrt{2}}{n}} = y$$

$$\ln y = \frac{\sqrt{2}}{2n} \ln(n) = \frac{\sqrt{2}}{2}\left(\boxed{\frac{1}{n} \ln(n)}\right)$$

$$= \frac{\sqrt{2}}{2} \frac{\ln n}{n} \xrightarrow[L'H]{n \to \infty} \frac{\sqrt{2}}{2} \frac{\frac{1}{n}}{1} \xrightarrow{n \to \infty} 0$$

converges. $= \lim_{n \to \infty} \ln y \Longrightarrow$

$\lim_{n \to \infty} y = e^0 = 1$ inconclusive.

$$\sum_{n=1} \frac{n^{\sqrt{2}}}{2^n}$$

$$\left|\frac{a_{n+1}}{a_n}\right| = \frac{(n+1)^{\sqrt{2}}}{2^{n+1}} \cdot \frac{2^n}{n^{\sqrt{2}}} = \frac{(n+1)^{\sqrt{2}}}{n^{\sqrt{2}}} \cdot \frac{1}{2}$$

$$= \frac{\left(n\left(1+\frac{1}{n}\right)\right)^{\sqrt{2}}}{n^{\sqrt{2}}} \cdot \frac{1}{2} = \frac{n^{\sqrt{2}}\left(1+\frac{1}{n}\right)^{\sqrt{2}}}{2n^{\sqrt{2}}}$$

Ratio Test Rules

Teacher sucks.

$$= \frac{\left(1+\frac{1}{n}\right)^{\sqrt{2}}}{2} \xrightarrow{n \to \infty} \frac{1}{2} < 1$$ converges.

10.5

61 $\sum_{n=1}^{\infty} \frac{1\cdot 3 \cdots (2n-1)}{4^n 2^n n!}$

61 $\sum_{n=1}^{\infty} \frac{\boxed{1\cdot 3\cdots(2n-1)}}{4^n \cdot 2^n n!}$

$1\cdot 3\cdots(2(n+1)-1)$
$= 1\cdot 3\cdots(2n-1)(2(n+1)-1)$

$\left|\frac{a_{n+1}}{a_n}\right| = \frac{\cancel{1\cdot 3\cdots(2n-1)}(2(n+1)-1)}{4^{n+1}2^{n+1}(n+1)!} \cdot \frac{\cancel{4^n \cdot 2^n \cdot n!}}{\cancel{1\cdot 3\cdots(2n-1)}}$

$= \frac{2n+2-1}{4\cdot 2\cdot(n+1)} = \frac{2n+1}{8n+8} \xrightarrow{n\to\infty} \frac{2}{8} = \frac{1}{4} < 1$

$\Rightarrow$ Converges.

C11 Parametrics.

$(x(t), y(t), z(t))$ $(x''(t), y''(t), z''(t))$

Curves in $\mathbb{R}^2$

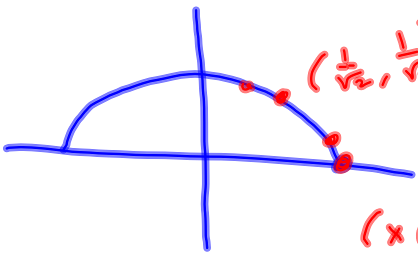
$x(t) = \cos t$, $y(t) = \sin t$

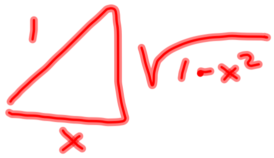
Eliminate the parameter

$x = \cos t \Longrightarrow$

$t = \arccos x \Longrightarrow y = \sin(\arccos x) = \sqrt{1-x^2}$

$0 \le t \le \pi$





= top $\frac{1}{2}$ of the unit circle!

$\left(x\left(\frac{\pi}{4}\right), y\left(\frac{\pi}{4}\right)\right) = \left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$

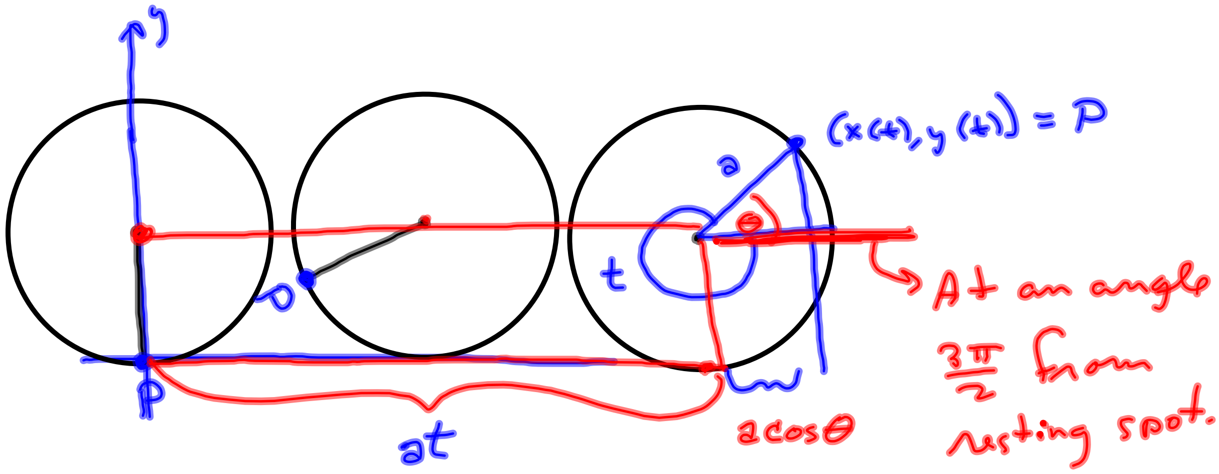
t	x	y
0	1	0
$\frac{\pi}{6}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$
$\frac{\pi}{3}$		
$\frac{\pi}{4}$		
$\frac{\pi}{2}$		

$x^2 + y^2$

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

so $x^2 + y^2 = 1$.

& you can SEE we're on the unit circle,



Now, get θ in terms of t.

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

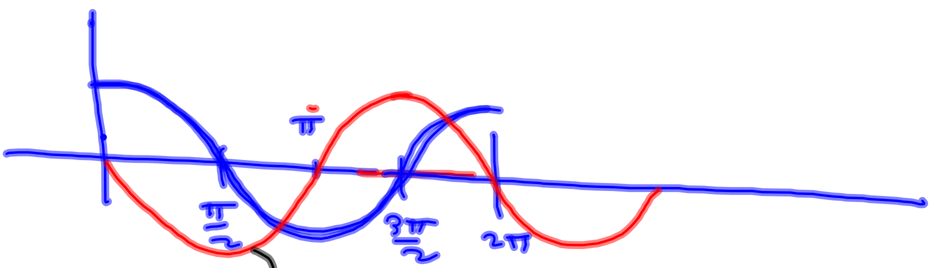
$$x(t) = at - \sin t$$
$$= a(t - \sin t)$$

$$t = \frac{3\pi}{2} - \theta$$

$$\theta = \frac{3\pi}{2} - t$$

$$at + a\cos\theta$$
$$= at + a\cos\left(\frac{3\pi}{2} - t\right)$$

$$\cos\left(\frac{3\pi}{2} - t\right) = \cos\left(-\left(t - \frac{3\pi}{2}\right)\right)$$
$$= \cos\left(t - \frac{3\pi}{2}\right) = -\sin t$$



cos t shifted right $\frac{3\pi}{2}$ units.

$\cos(2x+b) = \cos\left(2\left(x+\frac{b}{2}\right)\right)$

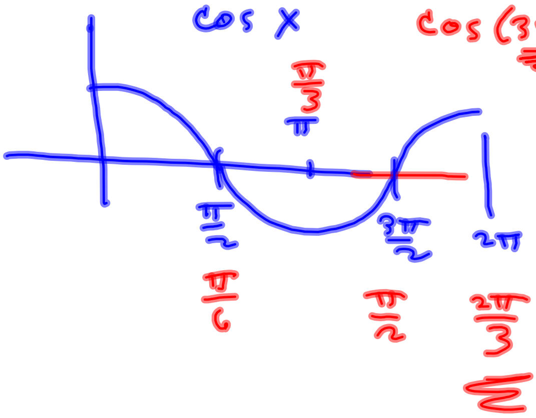
$\cos x \longmapsto \cos(2x+b)$

$(x,y) \longmapsto \left(\frac{1}{2}x, y\right) \longmapsto \left(\frac{1}{2}\left(x-\frac{b}{2}\right), y\right)$

$\cos(2x)$

$\cos(3x)$

$\cos x$



$f(2x) \rightsquigarrow$

$(x,y) \rightsquigarrow \left(\frac{1}{2}x, y\right)$

$f(x-c) \rightsquigarrow (x+c, y)$

$f(x+c) \rightsquigarrow (x-c, y)$

$3f(x)$

$(x,y) \rightsquigarrow (x, 3y)$

$f(3x)$

$(x,y) \rightsquigarrow \left(\frac{1}{3}x, y\right)$

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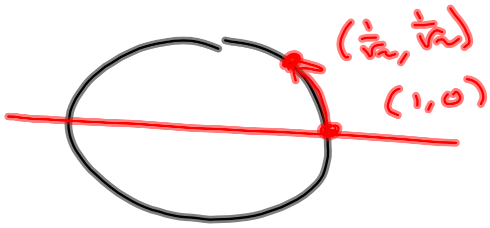
#s 1- 18 eliminate the parameter.

5 $x = \cos(2t)$, $y = \sin(2t)$

11.1 #s 1, 4, 7, 10, 13, 16, 20



Next § 11.2