(Textbook, appendix D)

- $\left.\begin{aligned}\sin(\theta+2\pi) &= \sin\theta\\ \cos(\theta+2\pi) &= \cos\theta\end{aligned}\right\} \to$ 2π - periodic

- $\left.\begin{aligned}\tan(\theta+\pi) &= \tan\theta\\ \cot(\theta+\pi) &= \cot\theta\end{aligned}\right\} \to$ π - periodic

In fact, $\sin(\theta + 2\pi\cdot k) = \sin\theta$
for all k - integers.

Additional trig identities:

$$\sin(2x) = 2\sin x\cos x$$
$$\cos(2x) = \cos^2 x - \sin^2 x$$

$$\cos^2 x = \frac{1+\cos 2x}{2}$$
$$\boxed{\sin^2 x = \frac{1-\cos 2x}{2}}$$

e.g. $\sin 15^\circ = \sin\frac{\pi}{12} = \sqrt{\frac{1-\cos\frac{\pi}{6}}{2}}$

$\sqrt{1-\sqrt{3}}$

$$= \sqrt{\frac{1 - \frac{\sqrt{3}}{2}}{2}} = \sqrt{\frac{1}{2} - \frac{\sqrt{3}}{4}}$$

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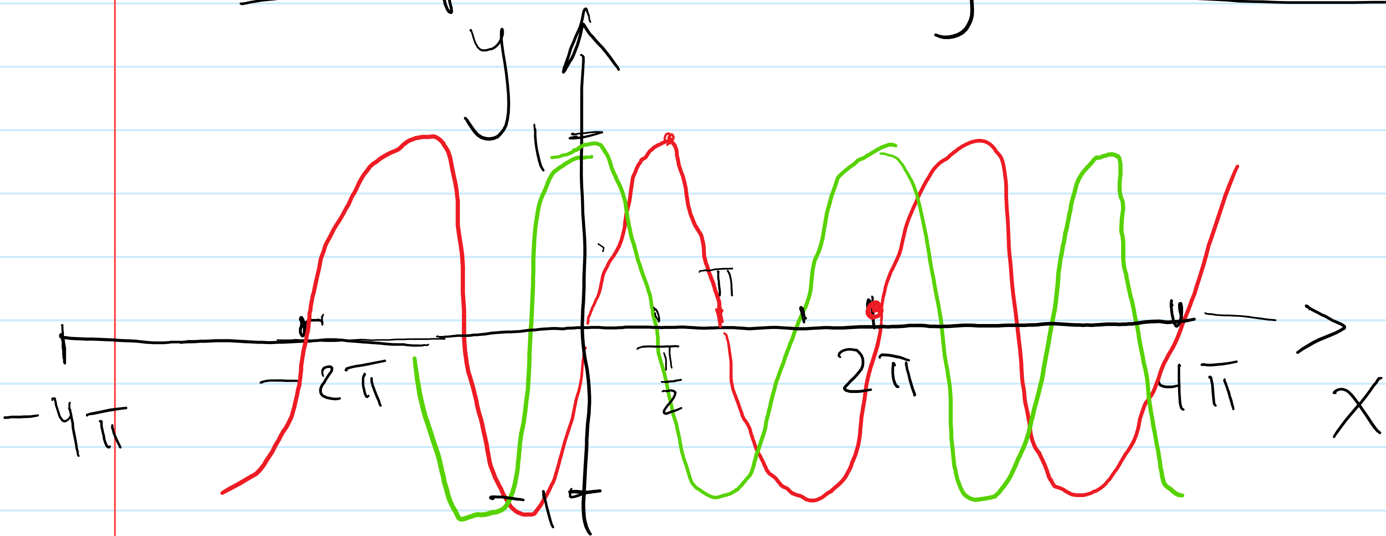
Graphs of trig functions



sin x

cos x

$$\boxed{\sin\left(x+\frac{\pi}{2}\right)=\cos x}$$

The graph of cosine can be obtained from the graph of sine by shifting it $\frac{\pi}{2}$ units to the left!

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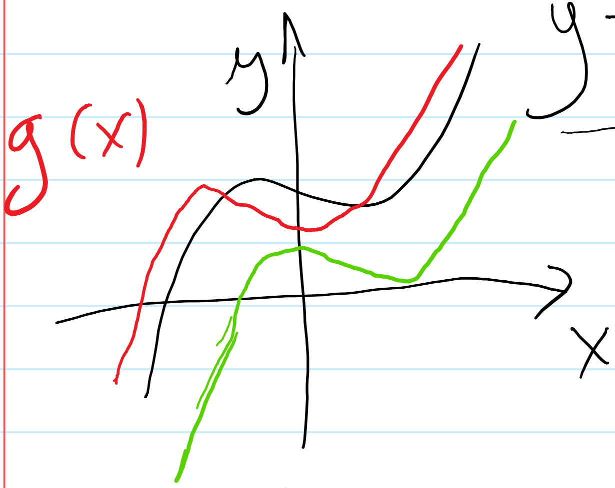


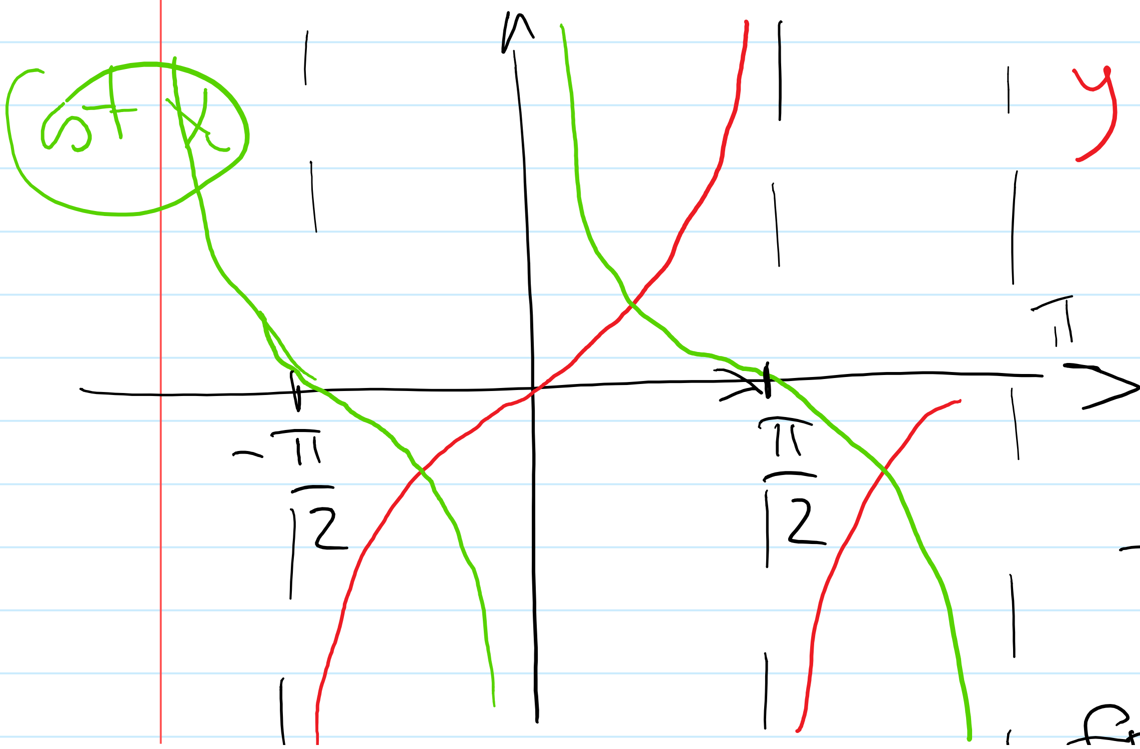
$y = f(x) \mapsto$

- $y = f(\underline{x+1}) = g(x)$

Shift the graph 1-unit left

- $y = f(x) - 2 = h(x)$

shift the graph 2 units down



$y = \tan x$

$\tan\frac{\pi}{2}$ is undefined but

$\tan x \to \infty$ as $x \to \frac{\pi}{2}$

from the le

as $x \to \frac{\pi}{2}$ from the left

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Exponential functions (1.4)

$\boxed{f(x) = b^x}$ $b > 0$

example: $f(x) = 2^x$ $\boxed{2 = \text{base of the exp}}$

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

$f(10) = 2^{10} = 2 \cdot 2 \cdot \ldots \cdot 2 = 1024$

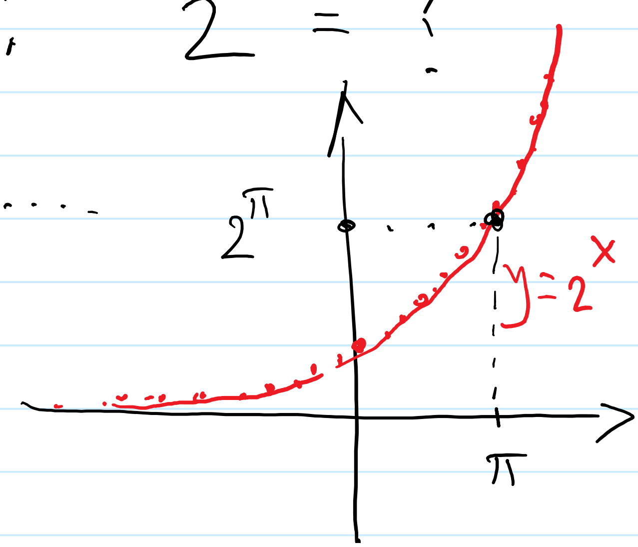
$f(\frac{1}{2}) = 2^{\frac{1}{2}} = \sqrt{2} = 1.41\ldots\ldots$

$f(\frac{3}{4}) = 2^{\frac{3}{4}} = \sqrt[4]{2^3} = \sqrt[4]{8} \simeq$

$f(-\frac{1}{3}) = 2^{-\frac{1}{3}} = \frac{1}{2^{1/3}} = \frac{1}{\sqrt[3]{2}}$

$f(\sqrt{2}) = 2^{\sqrt{2}}$? $2^{\pi} = ?$

$\sqrt{2} \simeq 1.41\ldots$



π

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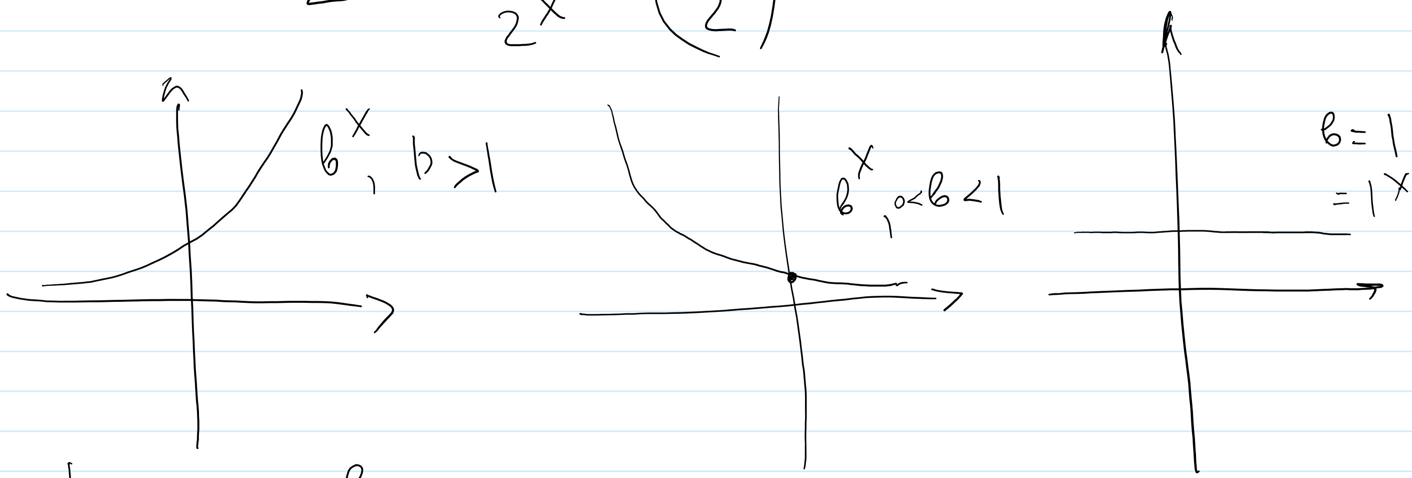
$$f(x) = 2^{-x} = \frac{1}{2^x} = \left(\frac{1}{2}\right)^x$$



Laws of exp:

$$b^{x+y} = b^x \cdot b^y \qquad (b^x)^y = b^{x \cdot y}$$

$$b^{x-y} = \frac{b^x}{b^y} \qquad (ab)^x = a^x \cdot b^x$$

999, $\quad 9^{9^9}$? 9^{99} 99^9 ?	$e = ?$