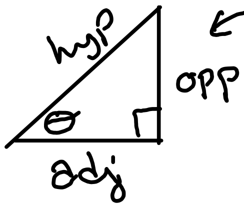
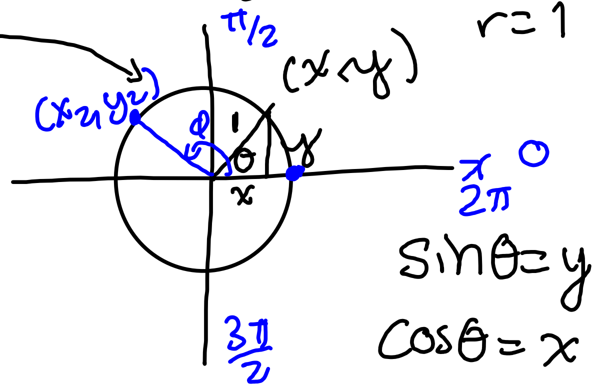
Connect the picture of the right triangle, unit circle, and sine/cosine/tangent graphs.





$\sin = \frac{opp}{hyp}$

$\sin\theta = y$

$\cos\theta = x$

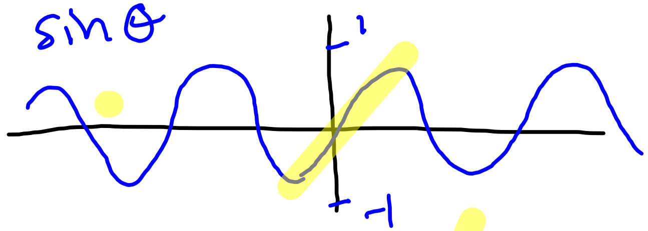
$\cos = \frac{adj}{hyp}$

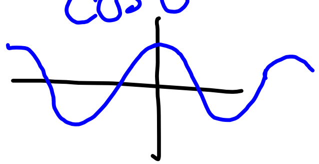
$\sin\varphi = y_2$

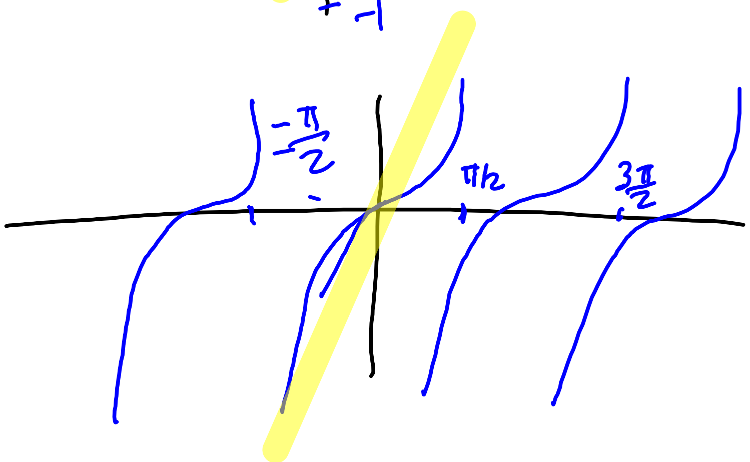
$\cos\varphi = x_2$

$\sin\theta$

$\cos\theta$







1. $\dfrac{x^2-6x+9}{x^3-27} \div \dfrac{3-x}{x+3}$

a) $\dfrac{-x-3}{x^2+3x+9}$, $x \neq 3$ b) $\dfrac{1}{x+3}$, $x \neq 3$ c) $\dfrac{x+3}{x^2+3x+9}$, $x \neq 3$ d) $\dfrac{-1}{x+3}$, $x \neq 3$

e) None of these

$$\frac{\cancel{(x-3)}^2}{\cancel{(x-3)}(\ ?\ )} \cdot \frac{x+3}{-\cancel{(x-3)}} = \frac{-(x+3)}{(\ ?\ )}$$

$$(x-3)(x^2+3x+9)$$

2. Find the domain of

$$\frac{\sqrt{x-3}}{log_4(10-x)}$$

a) $\cancel{[3,10)}$ b) $\cancel{[3,10]}$ c) $\cancel{[3,9)\cup(9,10]}$ d) $[3,9)\cup(9,10)$ e) None of these

1) $\sqrt{\quad}$

2) log

3) $\log_4(10-x)=0 \Rightarrow$

$x=?$

1) $x-3\geq 0$

$x\geq 3$

2) $10-x>0$

$10>x$

$\log 1=0$

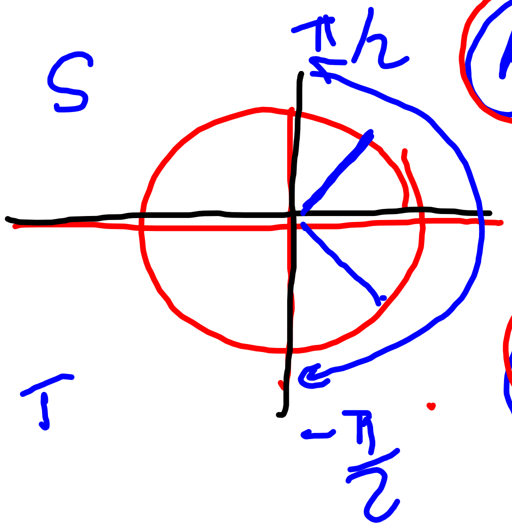
$10-x=1$

$9=x$

$x\neq 9$

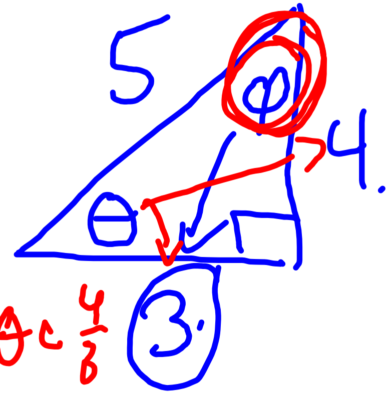
3. Find $\cos\left(\tan^{-1}\left[\frac{3}{4}\right]\right)$

a) $\cancel{\frac{3}{5}}$ b) $\frac{4}{5}$ c) $\cancel{\frac{-3}{5}}$ d) $\frac{-4}{5}$ e) None of these



A

C



$\tan\theta = \frac{4}{3}$

$$\boxed{\tan^{-1}x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]}$$

$$\cos\left(\tan^{-1}\left[-\frac{3}{4}\right]\right) = +4/5$$

$$\sin\left(\tan^{-1}\left[-\frac{3}{4}\right]\right) = ?\ -\frac{3}{5}$$

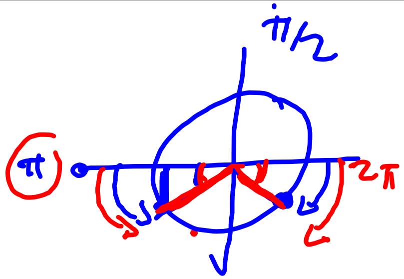
4. Find the sum of all solutions to

$$\sin^2 x - \frac{1}{2}\sin x - \frac{1}{2} = 0$$

on the interval $[0, 2\pi)$.

Hint: $y^2 - \frac{1}{2}y - \frac{1}{2} = (y - 1)\left(y + \frac{1}{2}\right)$

a) $\frac{13\pi}{6}$ b) $\frac{19\pi}{6}$ c) $\frac{7\pi}{3}$ d) $\frac{7\pi}{2}$ e) None of these

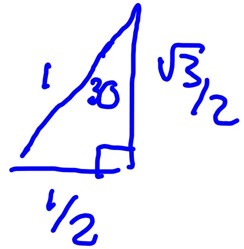


$$(\sin x - 1)\left(\sin x + \frac{1}{2}\right) = 0$$

$\sin x = 1$, $\sin x = -1/2$

$x = \pi/2$

$30^\circ = \pi/6$



$2\pi - \pi/6$, $\pi + \frac{\pi}{6}$

$$\frac{12\pi}{6} - \frac{\pi}{6} = \frac{11\pi}{6}, \quad \frac{7\pi}{6}$$

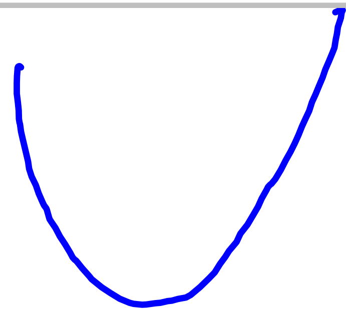
$$\frac{3\pi}{6} + \frac{11\pi}{6} + \frac{7\pi}{6} = \frac{\cancel{21}^{\,7}\pi}{\cancel{6}_{\,2}} = \frac{7\pi}{2}$$

5. Find the coordinates of the maximum $(x, f(x))$ of

$$f(x) = x^2 - x - 20$$

a) $(5, -4)$ b) $\left(\frac{1}{4}, -19\frac{3}{4}\right)$ c) $\left(\frac{-1}{2}, -19\frac{3}{4}\right)$ d) $\left(\frac{1}{2}, 19\frac{3}{4}\right)$

e) None of these



$$\left(x^2 - x + \frac{1}{4}\right) - 20 + \frac{1}{4} - \frac{1}{4}$$

$$\left(x - \frac{1}{2}\right)^2 - 19\,3/4 = f(x)$$

$$\left(\frac{1}{2}, -20\frac{1}{4}\right)$$

$$f(x) = 3x^2 + 4x + 5$$

$$= 3\left(x^2 + \frac{4}{3}x + \frac{4}{9}\right) + 5 - \frac{4}{3}$$

$2a = \frac{4}{3}$ $\quad a = \frac{4}{6} = \frac{2}{3}$; $a^2 = \frac{4}{9}$

$$(x+a)^2 = x^2 + 2ax + a^2$$

$$3\left(x+\frac{2}{3}\right)^2 + \frac{15}{3} - \frac{4}{3} =$$

$$3\left(x+\frac{2}{3}\right)^2 + \frac{11}{3}$$

$\sin(x + 30^\circ)$ $\quad$ $\sin\left(x + \frac{\pi}{6}\right)$

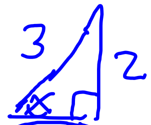
where $\sin x = 2/3$

$\sin(x+y) = \sin x \cos y + \cos x \sin y$

$\overset{2/3}{\sin x} \cdot \overset{\sqrt{3}/2}{\cos \frac{\pi}{6}} + \overset{\frac{\sqrt{5}}{3}}{\cos x} \overset{1/2}{\sin \frac{\pi}{6}}$

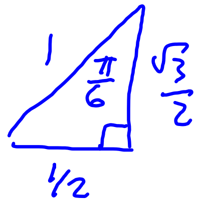
$\sin x = 2/3$

$\cos x = \dfrac{\sqrt{5}}{3}$

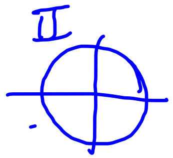


$\sqrt{3^2 - 2^2} = \sqrt{9-4} = \sqrt{5}$

$\frac{2}{3} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{5}}{3} \cdot \frac{1}{2} =$



$\dfrac{2\sqrt{3}}{6} + \dfrac{\sqrt{5}}{6} = \dfrac{2\sqrt{3} + \sqrt{5}}{6}$



Now assume x is in Q2

if x is in quad 2 $\cos x < 0$

$\frac{2}{3} \cdot \frac{\sqrt{3}}{2} - \frac{\sqrt{5}}{3} \cdot \frac{1}{2}$

$f(x) = \frac{1}{3x^2+2}$ Difference quotient

$$\frac{f(x+h) - f(x)}{h} =$$

$$\frac{\frac{1}{3(x+h)^2+2} - \frac{1}{3x^2+2}}{h} =$$

$$\frac{\frac{1}{3[x^2+2xh+h^2]+2} - \frac{1}{3x^2+2}}{h}$$

$$\frac{\cancel{3x^2}\cancel{+2} - \cancel{3x^2} - 6xh - 3h^2 \cancel{-2}}{h}$$

$$\frac{-6xh-3h^2}{} \cdot \frac{1}{h} = \frac{-3\cancel{h}(2x+h)}{} \cdot \frac{1}{\cancel{h}}$$

$$\frac{-3(2x+h)}{} = \frac{-3(2x+h)}{(3(x+h)^2+2)(3x^2+2)}$$

Title: Dec 8-1:44 PM (9 of 10)

$\sin^2 x + \cos^2 x = \frac{1}{53}$

on $[0, 2\pi)$

no x for which this is true.

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

$\sin x + \cos x = \frac{1}{53}$ can't do now

$\sin x \cos x = 1/53$

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

$2\sin x \cos x = 2/53$

$\sin 2x = 2/53$

$2x = \sin^{-1}(2/53)$