10/29/2012 - Sec 4.2 (cont.) Math 1060

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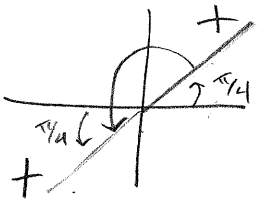
Sec 4.2 cont

$\cos x = a$

$\sin x = a$

$\tan x = 1$

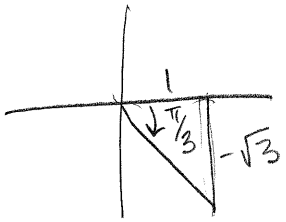


$x = \frac{\pi}{4} + 2\pi k$

$x = \frac{5\pi}{4} + 2\pi k$

$\Big\} x = \frac{\pi}{4} + \pi k$

$\tan x = -\frac{\sqrt{3}}{1}$ $\frac{y}{x}$ $\quad x = -\frac{\pi}{3} + \pi k$



$\tan x = 2.5$

$x = \tan^{-1}(2.5)$

$\{x \mid x = \tan^{-1}(2.5) + \pi k\}$

$\{x \mid x = 1.19 + \pi k\}$

Solving Equations

Ex: $2\sqrt{x} + 5 = 7$

Ex: $2\sin x + 5 = 7$

$-5 \quad -5$

$$\frac{2\sin x}{2} = \frac{2}{2}$$

$$\sin x = 1$$

$$x = \frac{\pi}{2} + 2\pi k$$

$2\sin x + 2 = 3$

$-2 \quad -2$

$0 \le x \le 360^\circ$

$$\frac{2\sin x}{2} = \frac{1}{2}$$

$$\sin x = \frac{1}{2}$$

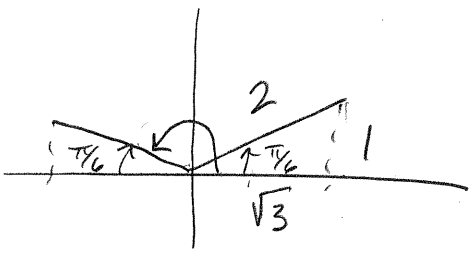
$$x = \frac{\pi}{6} + 2\pi k$$

or

$$x = \frac{5\pi}{6} + 2\pi k$$

$30^\circ, 150^\circ$

$150^\circ \cdot \frac{\pi}{180} = \frac{5\pi}{6}$



$\pi - \frac{\pi}{6} = \frac{5\pi}{6}$

#61 Solve for y, where $0 \le y \le \frac{\pi}{3}$

$$\frac{x}{2} = \frac{2\cos(3y)}{2}$$

$$\frac{x}{2} = \cos(3y)$$

$$0 \le 3y \le \pi$$

$$\frac{1}{3} \cdot \cos^{-1}\left(\frac{x}{2}\right) = 3y \cdot \frac{1}{3}$$

$$0 \le \cos^{-1}(r) \le \pi$$

$$\boxed{y = \frac{1}{3}\cos^{-1}\left(\frac{x}{2}\right)}$$

$f(x) = 3\sin(2x) + 5, \quad -\frac{\pi}{4} \le x \le \frac{\pi}{4}$.

Find $f^{-1}(x)$, and determine Domain & Range

f^{-1}: switch x & y

$y = 3\sin(2x) + 5$

$x = 3\sin(2y) + 5 \quad ; \quad -\frac{\pi}{4} \le y \le \frac{\pi}{4}$

$x - 5 = 3\sin(2y)$

$\frac{x-5}{3} = \sin(2y)$

$\frac{x-5}{2} = \sin(2y)$

$\frac{1}{2} \cdot \sin^{-1}\left(\frac{x-5}{3}\right) = 2y \cdot \frac{1}{2}$

$\frac{1}{2}\sin^{-1}\left(\frac{x-5}{3}\right) = y$

✓ $f^{-1}(x) = \frac{1}{2}\sin^{-1}\left(\frac{x-5}{3}\right)$

✓ D: $2 \le x \le 8$

✓ R: $-\pi/4 \le y \le \pi/4$

check: $-\frac{\pi}{4} \le y \le \frac{\pi}{4}$ ✓

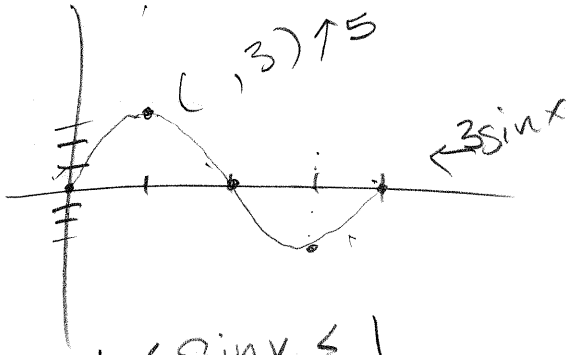
$-\pi/2 \le 2y \le \pi/2$

Range of $y = 3\sin(2x) + 5$

up 5

Amp 3

period $\frac{2\pi}{2} = \pi$



$-1 \le \sin x \le 1$

$-3^{+5} \le 3\sin x^{+5} \le 3^{+5}$

$2 \le 3\sin x + 5 \le 8$

$2 \le y \le 8$

↑ Range of original

Sec 4.3 Multiple Angle Equations

in Sec 4.2

$\sin x = \frac{1}{2}$

Multiple Angle Eq'n

$\sin(2\alpha) = \frac{1}{2}$

Process:

- Solve for the Multiple Angle (2α) just like before when we solved for x
- Add last step of solving for the actual variable

$\sin(2\alpha) = \frac{1}{2}$

$\frac{2\alpha}{2} = \frac{\frac{\pi}{6}}{2} + \frac{2\pi k}{2}$, $\frac{2\alpha}{2} = \frac{\frac{5\pi}{6}}{2} + \frac{2\pi k}{2}$

$\alpha = \frac{\pi}{12} + \pi k$, $\alpha = \frac{5\pi}{12} + \pi k$

Recall

$\sin x = \frac{1}{2}$

$x = \frac{\pi}{6} + 2\pi k$

$x = \frac{5\pi}{6} + 2\pi k$

$\tan(5x) = 1$, in the interval $[0°, 180°]$

$$\frac{5x}{5} = \frac{45°}{5} + \frac{K180°}{5}$$

$$x = 9° + 36°K$$

$K = -1$: $9 + 36(-1) = -27$ ~~-27~~

$K = 0$: $9° + 36°(0)$

$K = 1$: $9° + 36°(1)$

$K = 2$: $9° + 36°(2)$

$K = 3$: $9 + 36°(3)$

$K = 4$: $9 + 36(4)$ ~~189~~

$K = 5$: $9 + 36(5)$

$9°, 45°, 81, 117, 153$