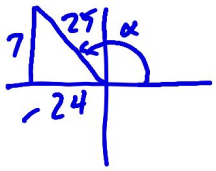
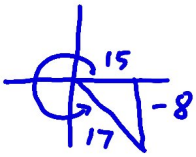
WARMUP - in your notes

Given $\tan\alpha = -\frac{7}{24}$ α in QII and $\sin\beta = \frac{-8}{17}$ β in QIV,



$\sin\alpha = \frac{7}{25}$

$\cos\alpha = -\frac{24}{25}$



$\sin\beta = -\frac{8}{17}$

$\cos\beta = \frac{15}{17}$

Find: $\sin(\alpha+\beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$

$= \frac{7}{25}\left(\frac{15}{17}\right) + \frac{-24}{25}\left(\frac{-8}{17}\right) = \frac{105}{425} + \frac{192}{425} = \frac{297}{425} = \frac{y}{r}$

$\cos(\alpha+\beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$

$= \frac{-24}{25}\cdot\frac{15}{17} - \frac{7}{25}\left(\frac{-8}{17}\right) = \frac{-360}{425} + \frac{56}{425} = \frac{-304}{425} = \frac{x}{r}$

$\tan(\alpha+\beta) = \frac{\frac{297}{425}}{\frac{-304}{425}} = \frac{297}{425}\cdot\frac{425}{-304} = -\frac{297}{304} = \frac{y}{x}$

What quadrant is $\alpha+\beta$ in? QII $\sin\theta > 0$, $\cos\theta < 0$ in QII

297, 304, 425

$297^2 + 304^2 = 425^2$

$$\frac{\tan 40^\circ - \tan 10^\circ}{1 + \tan 40^\circ \cdot \tan 10^\circ} = \tan 30^\circ = \frac{\sqrt{3}}{3}$$

$$\tan 165^\circ = \tan(120^\circ + 45^\circ) = \frac{\tan 120^\circ + \tan 45^\circ}{1 - \tan 120^\circ \tan 45^\circ}$$

$$= \frac{-\sqrt{3}+1}{1-(-\sqrt{3})\cdot 1} = \frac{(1-\sqrt{3})(1-\sqrt{3})}{(1+\sqrt{3})(1-\sqrt{3})}$$

$$= \frac{1-\sqrt{3}-\sqrt{3}+3}{1-3}$$

$2(2-\sqrt{3})$

$-2(-2+\sqrt{3})$

$= \frac{4-2\sqrt{3}}{-2} = \frac{-2(-2+\sqrt{3})}{-2}$

$= -2+\sqrt{3}$

1) $\sin\left(\frac{23\pi}{12}\right) = \sin 345^\circ = \sin(315^\circ + 30^\circ)$

$\frac{23\pi}{12} \cdot \frac{180}{\pi} = 345^\circ$

$= \sin 315^\circ \cos 30^\circ + \cos 315^\circ \sin 30^\circ$

$= -\frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \cdot \frac{1}{2} = -\frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \frac{-\sqrt{6}+\sqrt{2}}{4}$

2) $\tan(255^\circ) = \tan(300^\circ - 45^\circ) = \frac{\tan 300^\circ - \tan 45^\circ}{1 + \tan 300^\circ \tan 45^\circ}$

$= \frac{-\sqrt{3}-1}{1+(-\sqrt{3})(1)} = \frac{(-1-\sqrt{3})(1+\sqrt{3})}{(1-\sqrt{3})(1+\sqrt{3})}$

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

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

$= \frac{-2(2+\sqrt{3})}{-2}$

$= 2+\sqrt{3}$