2)

$$\tan 15^\circ = \tan(45^\circ - 30^\circ)$$

$$\frac{\tan 45 - \tan 30^\circ}{1 + \tan 45^\circ \tan 30^\circ} = \frac{1 - \frac{\sqrt{3}}{3}}{1 + \frac{\sqrt{3}}{3}} \cdot \frac{3}{3} = \frac{3-\sqrt{3}}{3+\sqrt{3}}$$

$$\frac{(3-\sqrt{3})}{(3+\sqrt{3})} \cdot \frac{(3-\sqrt{3})}{(3-\sqrt{3})} = \frac{9 - 3\sqrt{3} - 3\sqrt{3} + 3}{9-3} = \frac{12 - 6\sqrt{3}}{6}$$

$$\frac{\cancel{6}(2-\sqrt{3})}{\cancel{6}}$$

$$\boxed{= 2 - \sqrt{3}}$$

D 2)

$$\cos\frac{\pi}{12} = \cos\left(\frac{4\pi}{12} - \frac{3\pi}{12}\right) = \cos\left(\frac{\pi}{3} - \frac{\pi}{4}\right)$$

$$\cos\frac{\pi}{3}\cos\frac{\pi}{4} + \sin\frac{\pi}{3}\sin\frac{\pi}{4}$$

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

$$\frac{\sqrt{2}}{4} + \frac{\sqrt{6}}{4} = \frac{\sqrt{2}+\sqrt{6}}{4}$$

22

$$\frac{\cos(\alpha-\beta)}{\cos(\alpha+\beta)} = \frac{\cot\alpha+\tan\beta}{\cot\alpha-\tan\beta}$$

$\cot\alpha = \frac{\cos\alpha}{\sin\alpha}$

$\tan\beta = \frac{\sin\beta}{\cos\beta}$

$$\frac{(\cos\alpha\cos\beta+\sin\alpha\sin\beta)/(\sin\alpha\cos\beta)}{(\cos\alpha\cos\beta-\sin\alpha\sin\beta)/(\sin\alpha\cos\beta)}$$

$$\frac{\frac{\cos\alpha\cancel{\cos\beta}}{\sin\alpha\cancel{\cos\beta}}+\frac{\cancel{\sin\alpha}\sin\beta}{\cancel{\sin\alpha}\cos\beta}}{\frac{\cos\alpha\cancel{\cos\beta}}{\sin\alpha\cancel{\cos\beta}}-\frac{\cancel{\sin\alpha}\sin\beta}{\cancel{\sin\alpha}\cos\beta}} = \frac{\frac{\cos\alpha}{\sin\alpha}+\frac{\sin\beta}{\cos\beta}}{\frac{\cos\alpha}{\sin\alpha}-\frac{\sin\beta}{\cos\beta}}$$

$$= \frac{\cot\alpha+\tan\beta}{\cot\alpha-\tan\beta}$$

23

$13 \quad \tan^{-1}\left(\frac{12}{5}\right)$

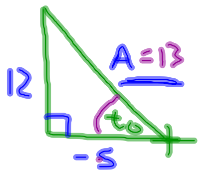
$$\frac{\cancel{A}\cos(t-t_0)}{\cancel{A}} = \frac{-5\cos t}{A}+\frac{12\sin t}{A}$$

$$\cos(t-t_0) = \frac{-5}{A}\cos t+\frac{12}{A}\sin t$$

$$\cos t\cos t_0+\sin t\sin t_0 = \frac{-5}{A}\cos t+\frac{12}{A}\sin t$$

CAH

so $\cos t_0 = \frac{-5}{A}$ $\quad \sin t_0 = \frac{12}{A}$



$= 13\cos\left(t-\tan^{-1}\left(\frac{12}{-5}\right)\right)$ $\quad \tan t_0 = \frac{12}{-5}$

$13\cos\left(t+\tan^{-1}\left(\frac{12}{5}\right)\right)$ $\quad \tan^{-1}\left(\frac{12}{-5}\right) = t_0$

$A = \sqrt{(-5)^2+(12)^2}$

$A = \sqrt{169} = 13$

because $\tan^{-1}\left(\frac{12}{-5}\right) = -\tan^{-1}\left(\frac{12}{5}\right)$