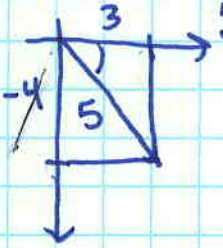
Day 1

352: 1, 2, 4, 9, 10, 12, 15

1. $\cos\theta = \frac{3}{5}$ $(270°, 360°)$



$\cos 2\theta = 2\cos^2\theta - 1$

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

$= 2\left(\frac{9}{25}\right) - 1$

$= \frac{18}{25} - 1 = \boxed{\frac{-7}{25}}$ $\cos 2\theta$

$\sin 2\theta = 2\sin\theta\cos\theta$

$= 2\left(\frac{-4}{5}\right)\left(\frac{3}{5}\right)$

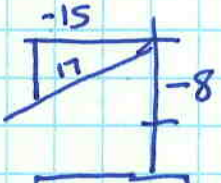
$= 2\left(\frac{-12}{25}\right) = \boxed{\frac{-24}{25}}$ $\sin 2\theta$

$\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$

$= \frac{2\left(\frac{-4}{3}\right)}{1-\left(\frac{-4}{3}\right)^2} = \frac{\left(-\frac{8}{3}\right)}{\left(1-\left(\frac{16}{9}\right)\right)} = \frac{\left(\frac{-8}{3}\right)}{\left(\frac{-7}{9}\right)}$

$= \frac{72}{21} = \boxed{\frac{24}{7} = \tan 2\theta}$

2. $\tan\theta = \frac{8}{15}$ $(180°, 270°)$



$h = \sqrt{64+225}$

$h = 17$

$\sin 2\theta = 2\sin\theta\cos\theta$

$= 2\left(-\frac{8}{17}\right)\left(\frac{-15}{17}\right)$

$= \boxed{\frac{240}{289}}$

$\cos 2\theta = 2\cos^2\theta - 1$

$= 2\left(\frac{-15}{17}\right)^2 - 1$

$= 2\left(\frac{225}{289}\right) - 1$

$= \frac{450}{289} - \frac{289}{289} = \boxed{\frac{161}{289}}$

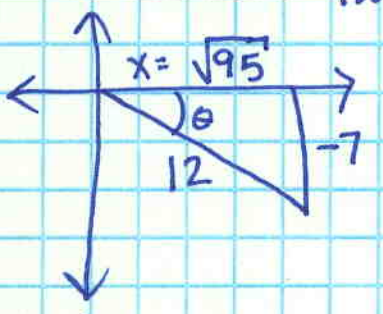
$\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta} = \frac{2\left(\frac{8}{15}\right)}{1-\left(\frac{8}{15}\right)^2} = \frac{\left(\frac{16}{15}\right)}{1-\frac{64}{225}}$

$\frac{\frac{16}{15}}{\frac{161}{225}} \left(\frac{\cancel{225}^{15}}{\cancel{289}\ 161}\right) \frac{3600}{3135}$

$= \boxed{\frac{\cancel{240}}{\cancel{209}}}$

$\boxed{\frac{240}{161}}$

4. $\sin\theta = -\frac{7}{12}$ on $\left(\frac{3\pi}{2}, 2\pi\right)$



$\sin\theta = -\frac{7}{12}$ $\cos\theta = \frac{\sqrt{95}}{12}$ $\tan\theta = -\frac{7}{\sqrt{95}}$

$(-7)^2 + x^2 = 12^2$

$+49 + x^2 = 144$

$x^2 = 95$

$x = \sqrt{95}$

$\sin 2\theta = 2\cos\theta\sin\theta$

$= 2\left(\frac{\sqrt{95}}{12}\right)\left(\frac{-7}{12}\right) = -\frac{14\sqrt{95}}{144} = \boxed{-\frac{7\sqrt{95}}{72}}$

$\cos 2\theta = 2\cos^2\theta - 1$

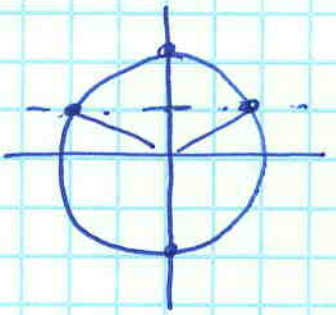
$= 2\left(\frac{\sqrt{95}}{12}\right)^2 - 1 = \frac{190}{144} - \frac{144}{144} = \frac{46}{144} = \boxed{\frac{23}{72}}$

$\tan 2\theta = \frac{2\tan\theta}{1-\tan^2\theta}$

$\frac{2\left(\frac{-7}{\sqrt{95}}\right)}{1-\left(\frac{-7}{\sqrt{95}}\right)^2} = \frac{\left(\frac{-14}{\sqrt{95}}\right)}{\frac{95}{95} - \frac{49}{95}} = \frac{-14^{-7}}{\sqrt{95}} \cdot \frac{95^{\sqrt{95}}}{46_{23}}$

$= \boxed{-\frac{7\sqrt{95}}{23}}$

9. $\sin 2\theta = \cos\theta$



$2\sin\theta\cos\theta - \cos\theta = 0$

$\cos\theta(2\sin\theta - 1) = 0$

$\cos\theta = 0$ $\quad$ $2\sin\theta - 1 = 0$

$\sin\theta = 1/2$

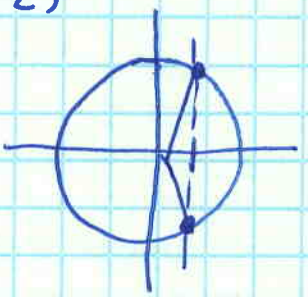
$\boxed{\theta = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}}$

10. $\cos 2\theta = \cos\theta$ $\quad$ * pick $\cos 2\theta = 2\cos^2\theta - 1$ to keep all cos.

$2\cos^2\theta - 1 - \cos\theta = 0$

$2\cos^2\theta - \cos\theta - 1 = 0$ $\rightleftarrows$ $2a^2 - a - 1$

$(2\cos\theta + 1)(\cos\theta - 2) = 0$ $\rightleftarrows$ $(2a+1)(a-2)$



$2\cos\theta + 1 = 0$ $\quad$ $\cos\theta - 2 = 0$

$\cos\theta = -\frac{1}{2}$ $\quad$ $\cos\theta = 2$

No solution

$\boxed{\theta = \frac{\pi}{3}, \frac{5\pi}{3}}$

12. $\tan 2\theta - \tan 2\theta \tan^2\theta = 2$

$\left(\frac{2\tan\theta}{1-\tan^2\theta}\right) - \left(\frac{2\tan\theta}{1-\tan^2\theta}\right)\tan^2\theta = 2$

same

$a - ab$

$a(1-b)$

$\left(\frac{2\tan\theta - 2\tan\theta\tan^2\theta}{1-\tan^2\theta}\right) = 2$

$\left(2\tan\theta\left(\frac{1-\tan^2\theta}{1-\tan^2\theta}\right)\right) = 2$ $\quad$ ($\frac{1-\tan^2\theta}{1-\tan^2\theta} \to 1$)

$2\tan\theta = 2$

$\tan\theta = 1$

$\boxed{\theta = \frac{\pi}{4}, \frac{5\pi}{4}}$

15. $d = \frac{v_0^2 \sin 2\theta}{32}$

$242 = \frac{88^2 \sin 2\theta}{32}$

$\frac{32(242)}{88^2} = 1 = \sin(2\theta) \rightarrow \sin^{-1} 1 = 90° = \alpha$

$2\theta = 90°, \quad \boxed{\theta = 45°}$

$\alpha =$

b. $d = \frac{v_0^2 (2 \sin\theta \cos\theta)}{32}$

$$\boxed{d = \frac{v_0^2 \sin\theta \cos\theta}{16}}$$