Name___Solutions_____ Trigonometry, Test 3

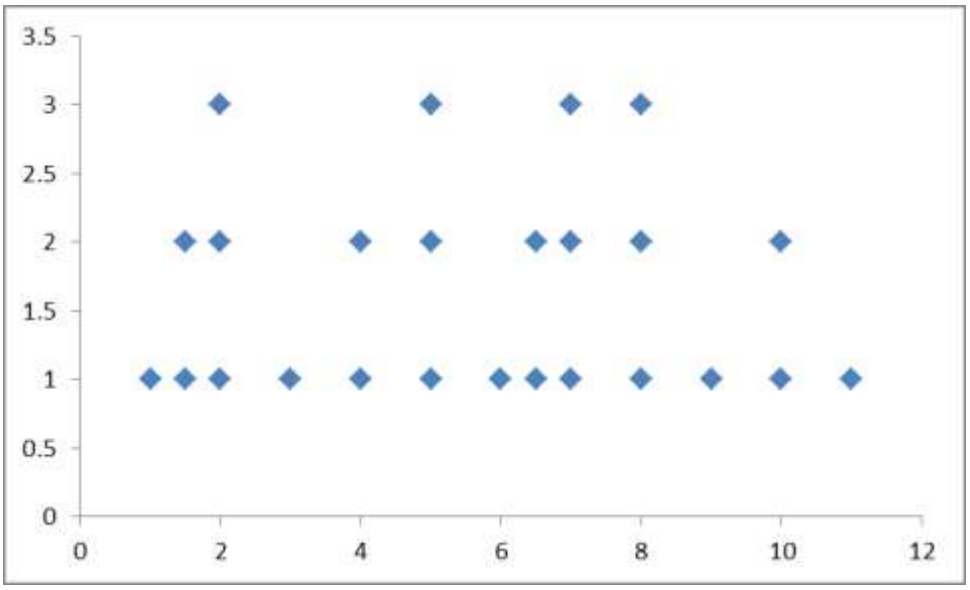
Calculator Portion: You may use a calculator on this page.

1) Solve the following equation for x. Show all your work and circle your final answer(s). (14 points)

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

$$2\cos^2(x) - \cos(x) = 0$$
$$\cos(x)\,(2\cos(x) - 1) = 0$$

$$\cos(x) = 0 \quad OR \quad 2\cos(x) - 1 = 0$$
$$x = \frac{\pi}{2} + 2\pi k, \frac{3\pi}{2} + 2\pi k \quad OR \quad \cos(x) = \frac{1}{2}$$
$$x = \frac{\pi}{2} + 2\pi k, \frac{3\pi}{2} + 2\pi k \quad OR \quad x = \frac{\pi}{3} + 2\pi k, x = -\frac{\pi}{3} + 2\pi k$$



2) Solve the following equation for x. Show all your work and circle your final answer(s). (11 points)

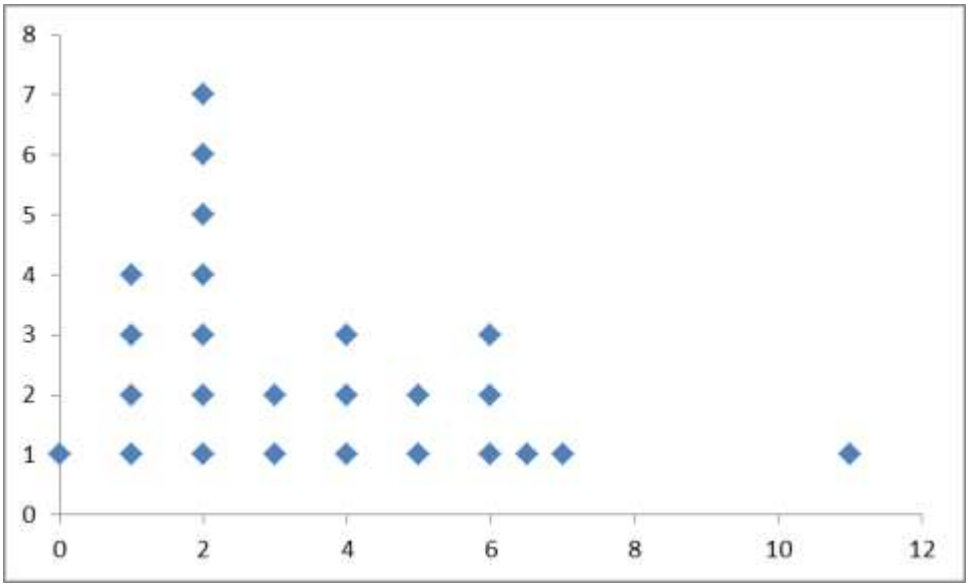
$$\tan^2(7x+3) = \frac{10}{3}$$

$$\tan(7x+3) = \pm\sqrt{\frac{10}{3}}$$

$$7x+3 = \tan^{-1}\left(\pm\sqrt{\frac{10}{3}}\right) + \pi k$$

$$7x+3 = \pm 1.06 + \pi k$$

$$x = \frac{\pm 1.06 - 3 + \pi k}{7}$$

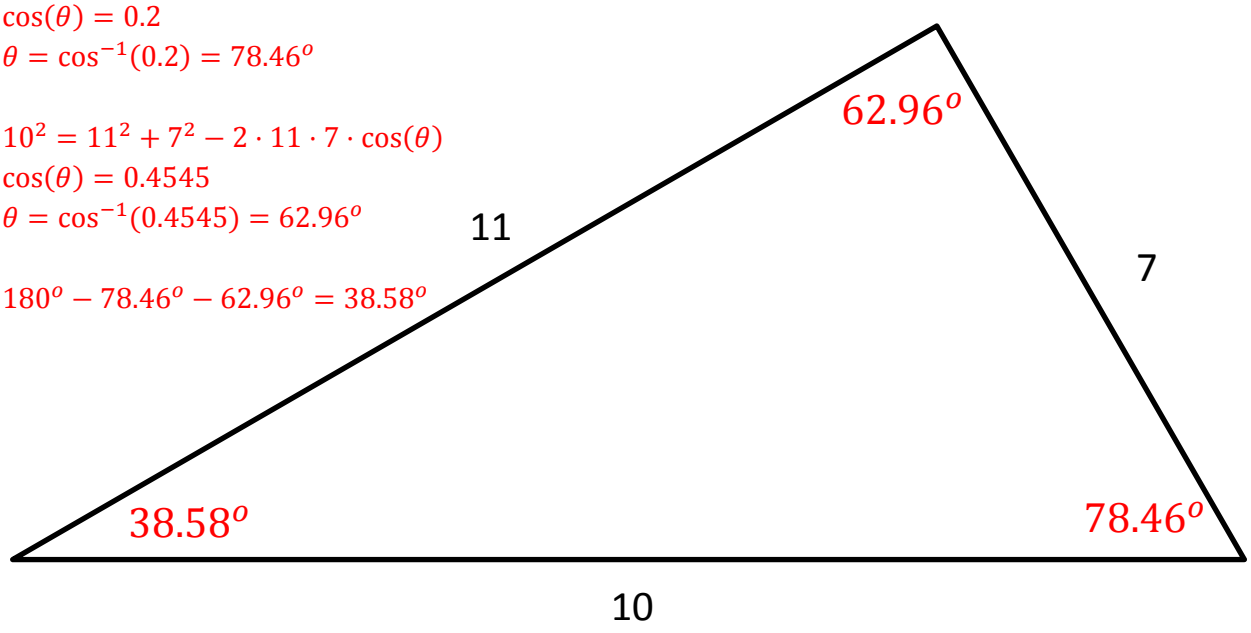


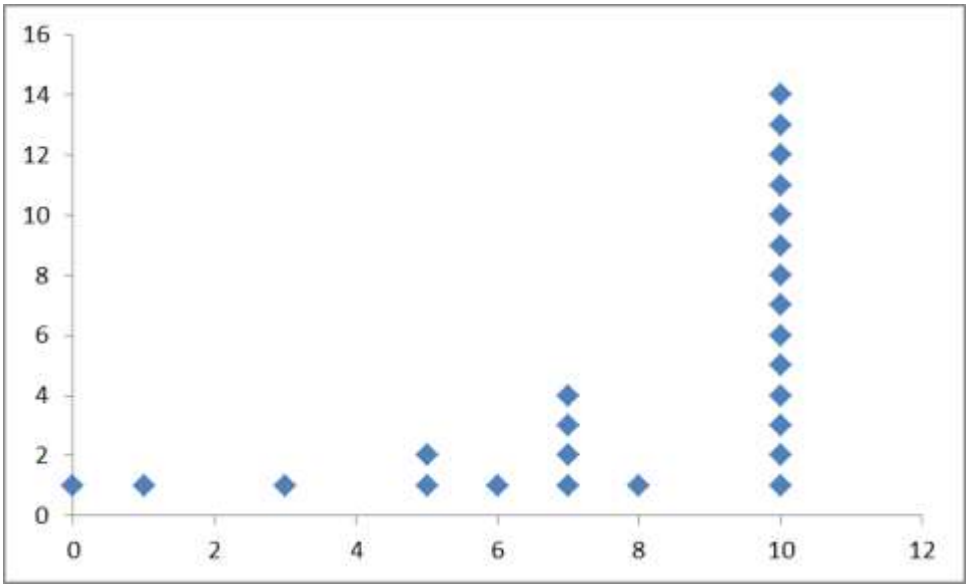
3) Solve for one of the missing angles in the triangle below. (Not to scale) (Be sure to label which angle you solved for. You do not need to find the other two angles) (10 points)

$11^2 = 10^2 + 7^2 - 2 \cdot 10 \cdot 7 \cdot \cos(\theta)$
$\cos(\theta) = 0.2$
$\theta = \cos^{-1}(0.2) = 78.46^o$

$10^2 = 11^2 + 7^2 - 2 \cdot 11 \cdot 7 \cdot \cos(\theta)$
$\cos(\theta) = 0.4545$
$\theta = \cos^{-1}(0.4545) = 62.96^o$

$180^o - 78.46^o - 62.96^o = 38.58^o$



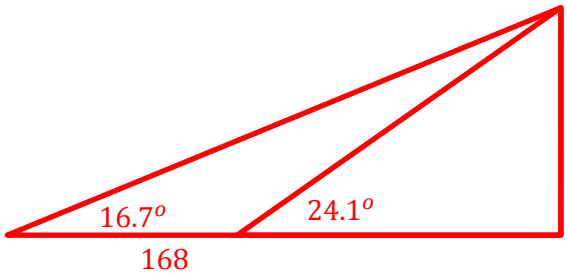


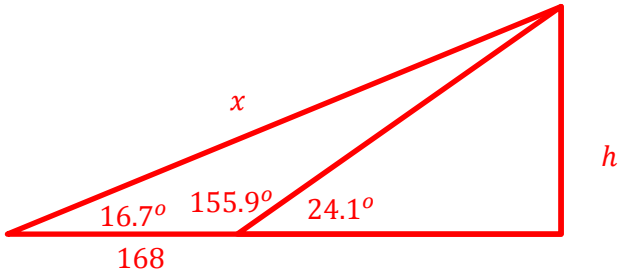
4) A certain tourist attraction has a rock that rises straight upward from the bottom of a valley. From one point the angle of elevation of the top of the rock is 16.7^o. From a point 168 feet closer to the rock, the angle of elevation of the top of the rock is 24.1^o. Draw a picture and determine how high the rock is. (15 points)

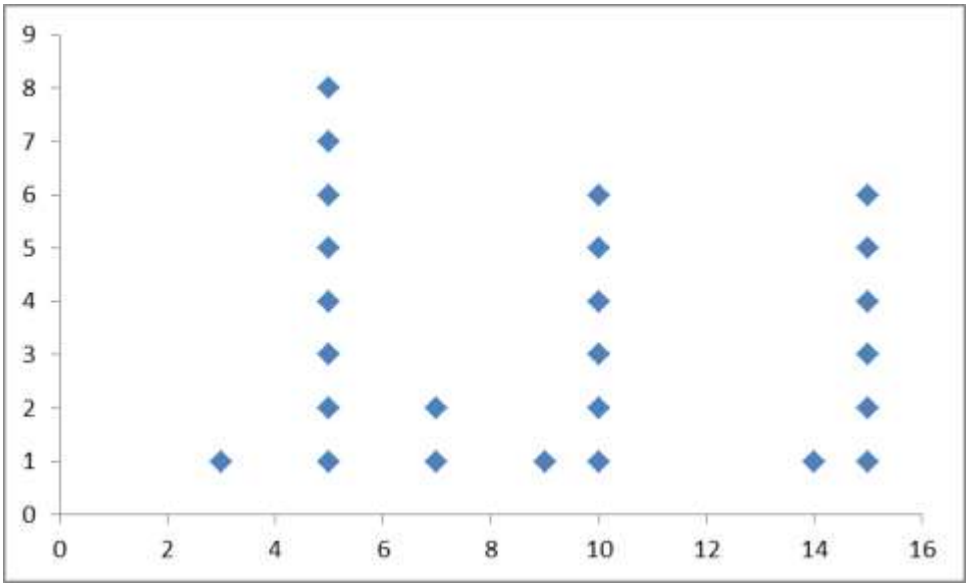
$180^o - 24.1^o = 155.9^o$
$180^o - 16.7^o - 155.9^o = 7.4^o$

$\frac{\sin(7.4^o)}{168} = \frac{\sin(155.9^o)}{x}$
$x = 532.6$

$sin(16.7^o) = \frac{h}{532.6}$
$h = 153.04$

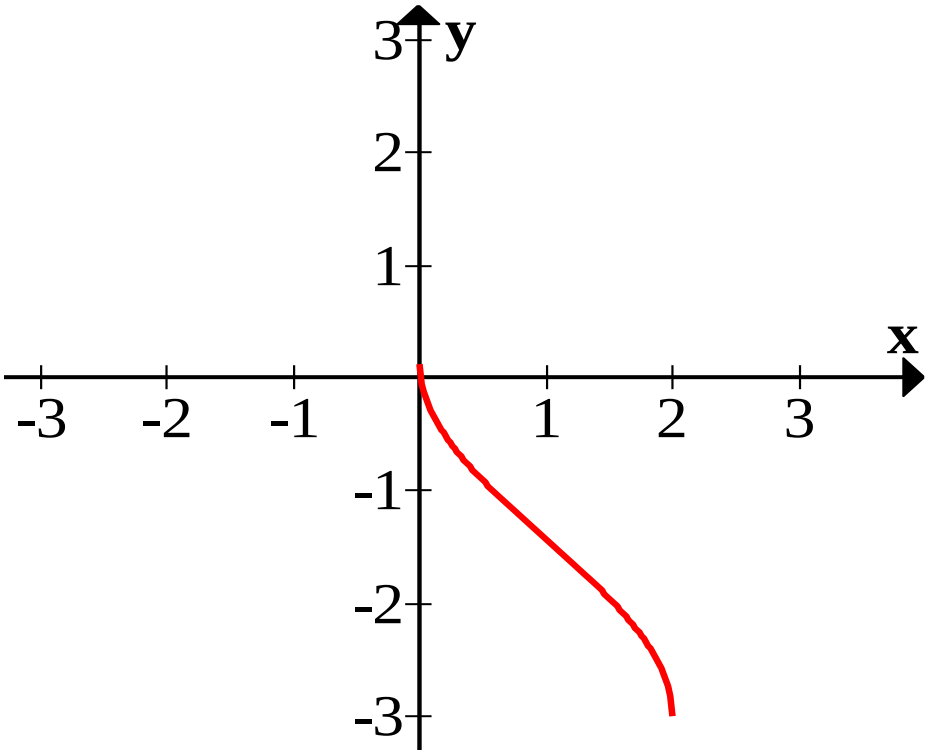


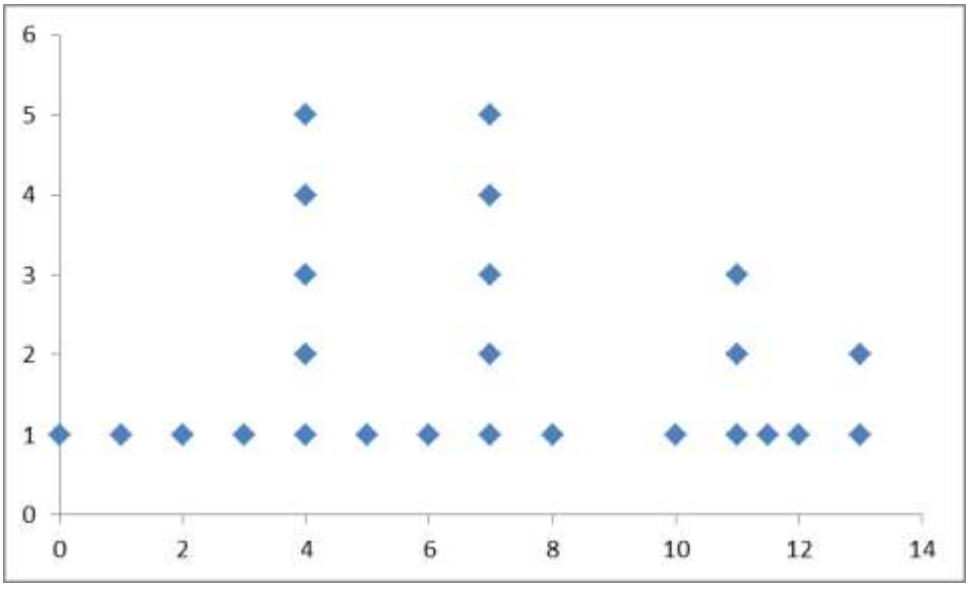




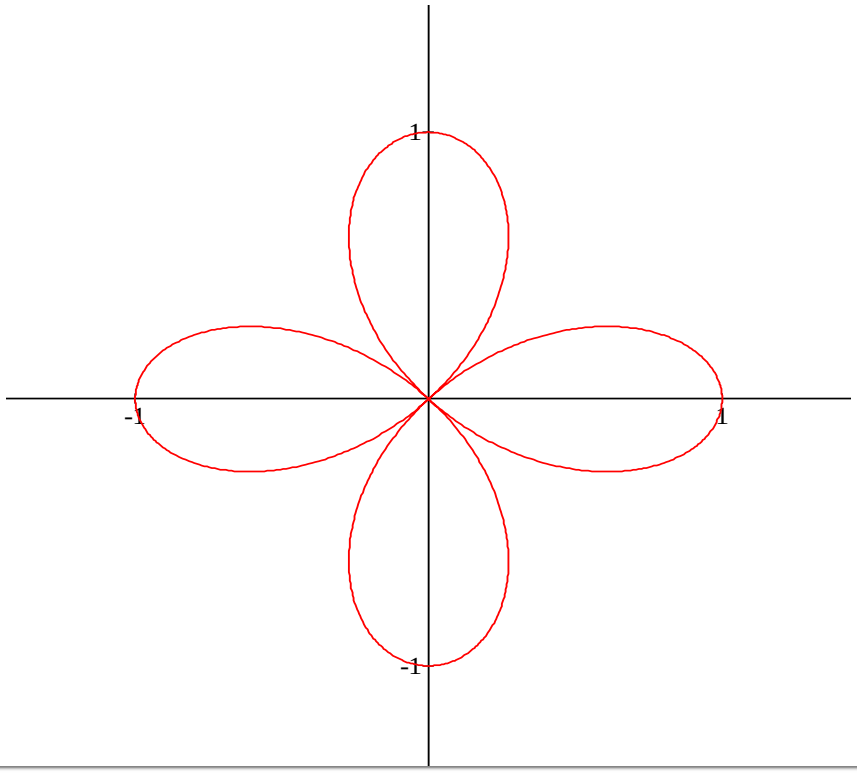
Non-Calculator Portion: You may not use a calculator on the rest of the test.

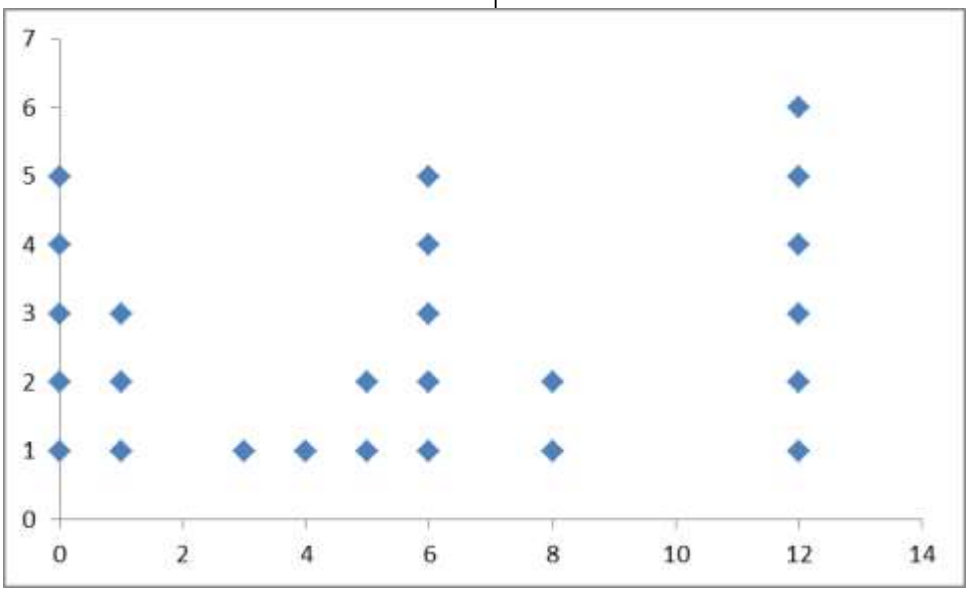
5) Label the axis below and graph the function $y = \cos^{-1}(x - 1) - 3$. (13 points)





6) On the axis below, graph the function $r = \cos(2\theta)$. (12 points)

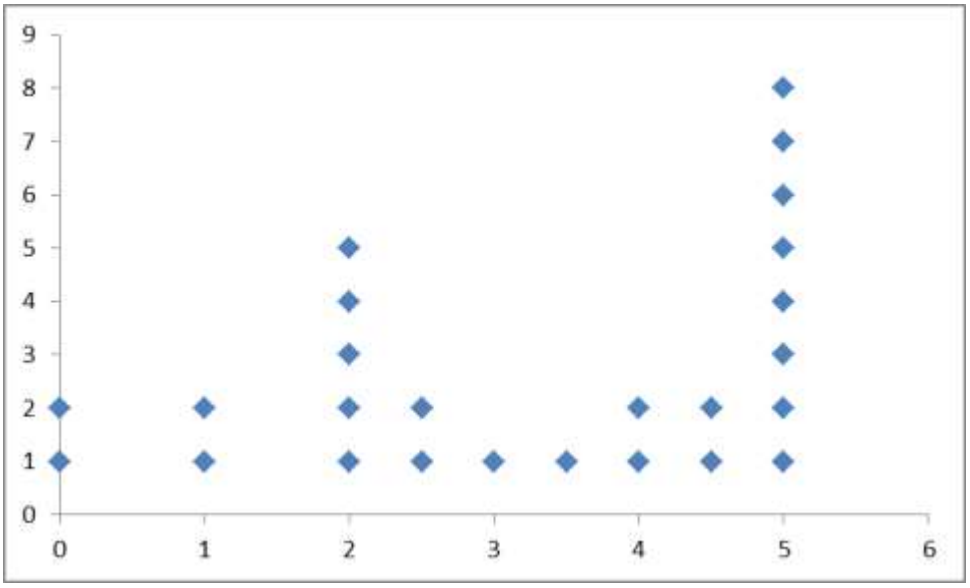




7) Find $\sin\left(\frac{13\pi}{12}\right)$. (5 points)

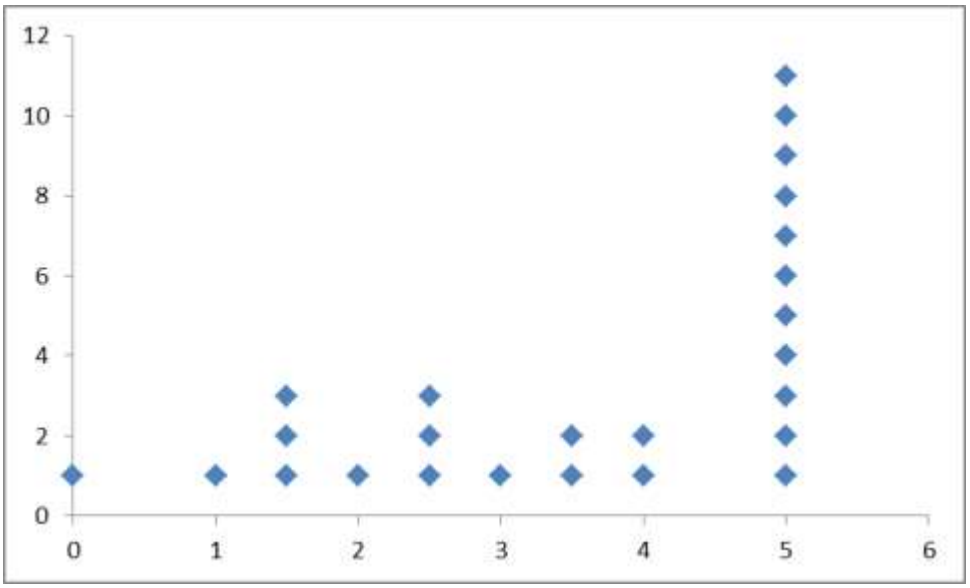
$$\sin\left(\frac{13\pi}{12}\right) = \sin\left(\frac{10\pi}{12} + \frac{3\pi}{12}\right) = \sin\left(\frac{5\pi}{6} + \frac{\pi}{4}\right) = \sin\left(\frac{5\pi}{6}\right)\cos\left(\frac{\pi}{4}\right) + \sin\left(\frac{\pi}{4}\right)\cos\left(\frac{5\pi}{6}\right)$$

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



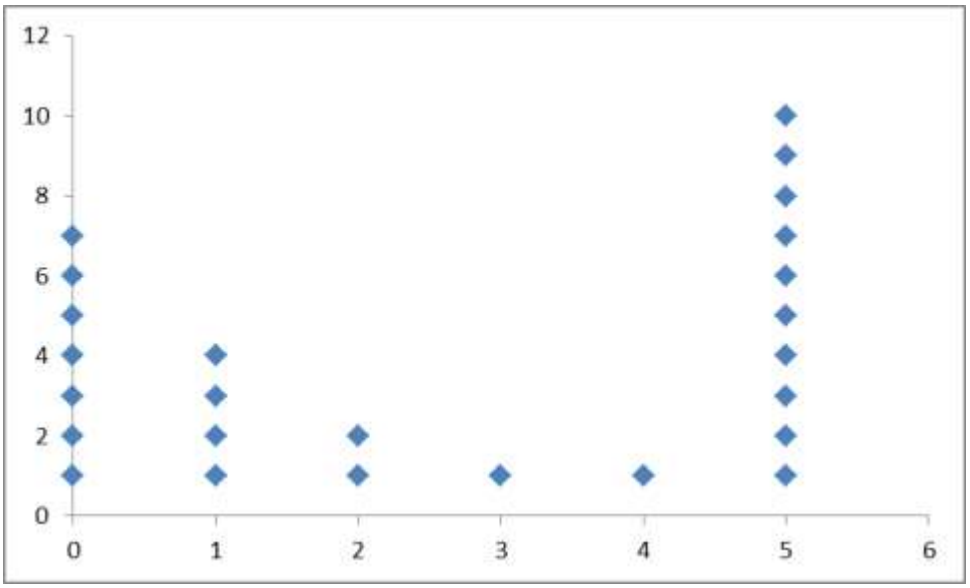
8) Find $\cos(15^o)\cos(30^o) - \sin(15^o)\sin(30^o)$. (5 points)

$$\cos(15^o + 30^o) = \cos(45^o) = \frac{1}{\sqrt{2}}$$



9) Find $\frac{2\tan(15^o)}{1-\tan^2(15^o)}$ (5 points)

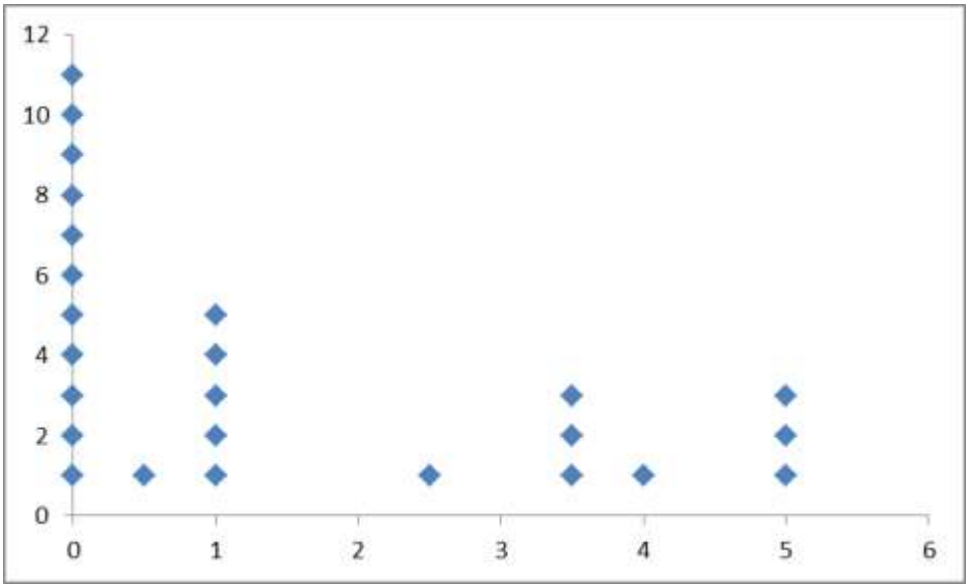
$$\tan(2 \cdot 15^o) = \tan(30^o) = \frac{1}{\sqrt{3}}$$



10) Write $\sqrt{3}\sin(x) + \cos(x)$ in terms of just a sine function. (5 points)

Use the reduction formula with $a = \sqrt{3}; b = 1$:

$$2\sin\left(x + \frac{\pi}{6}\right)$$



11) Find $\sin(22.5^o)\cos(22.5^o)$. (5 points)

$$\frac{1}{2}[\sin(22.5^o - 22.5^o) + \sin(22.5^o + 22.5^o)] = \frac{1}{2}[\sin(0^o) + \sin(45^o)] = \frac{1}{2}\left[0 + \frac{1}{\sqrt{2}}\right] = \frac{1}{2\sqrt{2}}$$