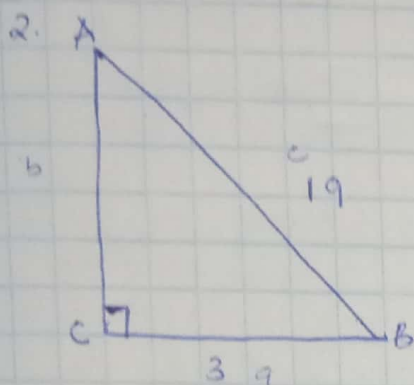


$$\begin{aligned}
 1. \quad \frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta} &= \frac{1-\sin\theta + 1+\sin\theta}{(1+\sin\theta)(1-\sin\theta)} \\
 &= \frac{2}{1-\sin^2\theta} = \frac{2}{\cos^2\theta} \\
 &= 2\sec^2\theta
 \end{aligned}$$



$$b = \sqrt{19^2 - 3^2} = 4\sqrt{22}$$

$$B = \tan^{-1}\left(\frac{4\sqrt{22}}{3}\right) = 80.92^\circ = 80.9^\circ$$

$$A = \tan^{-1}\left(\frac{3}{4\sqrt{22}}\right) = 9.1^\circ$$

$$3. \text{ Mean} = \frac{20+16+18+14+9+20+16}{7}$$

$$= 16.1429$$

X	$X - \bar{X}$	$(X - \bar{X})^2$
20	3.8571	14.8772
16	-0.1429	0.0204
18	1.8571	3.4488
14	-2.1429	4.592
9	-7.1429	51.021
20	3.8571	14.8772
16	-0.1429	0.0204
Total		88.8571

$$\sigma = \sqrt{\frac{88.8571}{7-1}} = 3.8483$$

$$4. \quad y = \frac{x-5}{x^2-6x+5}$$

$$x^2-6x+5=0$$

$$x^2-5x-x+5=0$$

$$x(x-5)-1(x-5)=0$$

$$(x-1)(x-5)=0$$

$$x=1, 5$$

Points of discontinuity = 1, 5

$$y = \frac{x-5}{(x-1)(x-5)}$$

$x=5$ is removable

$$5. \quad y = \frac{1}{4} \cos \frac{2\pi}{3} \theta$$

(a) Period

$$y = A \cos(Bx+c) + D$$

$$\text{Period} \Rightarrow \frac{2\pi}{B} = \frac{2\pi}{3}$$

$$\text{Period} = B = 3$$

$$(b) \quad A = \text{Amplitude} = \frac{1}{4}$$

$$(c) \text{Equation of midline} = D = 0$$

$$y = 0$$

6.

$$\sin 42 = \frac{h}{3280}$$

$$h = 3280 \sin 42^\circ = 2195 \text{ ft}$$

$$\begin{aligned}
 7. \quad & \frac{y^2}{y-3} \cdot \frac{y^2-y-6}{y^2+y} \\
 &= \frac{y^2}{y-3} \cdot \frac{(y-3)(y+2)}{y(y+1)} \\
 &= \frac{y(y+2)}{y+1} = \frac{y^2+2y}{y+1}
 \end{aligned}$$

Restriction, $y \neq -1$

$$8. \tan \theta + \cot \theta = \frac{1}{\sin \theta \cos \theta}$$

$$\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta} = \frac{1}{\sin \theta \cos \theta}$$

$$\frac{\sin^2 \theta + \cos^2 \theta}{\cos \theta \sin \theta} = \frac{1}{\sin \theta \cos \theta}$$

$$\therefore \cos^2 \theta + \sin^2 \theta = 1$$

$$\frac{1}{\cos \theta \sin \theta} = \frac{1}{\sin \theta \cos \theta}$$

9. Yes. It assumes that the students do not pay attention in class

10. 100, 100, 105, 113, 129, 132, 146, 152, 176, 200

30th percentile = 3rd = 105

90th percentile = $\frac{90}{100} \times 10 = 9^{\text{th}}$ item = 176

$$11. \frac{a+2}{a-5} \times \frac{a^2-8a+15}{a+1}$$

$$= \frac{a+2}{a-5} \times \frac{(a-3)(a-5)}{a+1} = \frac{(a+2)(a-3)}{a+1} = \frac{a^2-a-6}{a+1}$$

Restrictions = 5, -1, 3

$$12. (a) y = 18 \tan 45^\circ$$

$$= 18 \text{ feet}$$

$$(b) y = 18 \tan 55^\circ$$

$$= 25.71 \text{ feet}$$

$$(c) \text{Area} = \frac{1}{2}bh$$

$$b = \cancel{36 \text{ feet}}$$

$$= 2 \left(\frac{1}{2} \times 18 \times 18 \right)$$

$$= 324 \text{ ft}^2$$

$$\text{Area} = \frac{1}{2}bh$$

$$= 2 \left(\frac{1}{2} \times 18 \times 25.71 \right)$$

$$= 462.78 \text{ ft}^2$$

$$13 \quad \sec \theta \left(\frac{1}{\csc \theta - \cot \theta} - \frac{1}{\csc \theta + \cot \theta} \right)$$

$$\sec \theta \left(\frac{\csc \theta + \cot \theta - \csc \theta + \cot \theta}{(\csc \theta - \cot \theta)(\csc \theta + \cot \theta)} \right)$$

$$\sec \theta \left(\frac{2 \cot \theta}{(\csc \theta - \cot \theta)(\csc \theta + \cot \theta)} \right)$$

$$\frac{1}{\cos \theta} \left(\frac{2 \cot \theta}{\csc^2 \theta - \cot^2 \theta} \right) = \frac{1}{\cos \theta} \left(\frac{2 \cot \theta}{\sin \theta} \right)$$

$$= \frac{1}{\cos \theta} \left(2 \times \frac{\cos \theta}{\sin \theta} \times \frac{1}{\sin \theta} \right)$$

$$= \frac{2}{\sin \theta} = 2 \csc \theta$$

14. $y = -\frac{0.2}{x}$ $y = -\frac{0.3}{x}$

(i) They are not defined at $x = 0$.

(ii) The horizontal asymptotes for both is $y = 0$.

(iii) They never touch other.

15. $-3 \cos t = 1$ $0 \leq t \leq 2\pi$

$t = 1.91, 4.31$ radians

$$16 \quad h = 7 \cos\left(\frac{\pi}{3}t\right)$$

$$(a) \quad \cos\left(\frac{\pi}{3}t\right) = \frac{h}{7}$$

$$\frac{\pi}{3}t = \cos^{-1}\left(\frac{h}{7}\right)$$

$$t = \frac{3}{\pi} \cos^{-1}\left(\frac{h}{7}\right)$$

$$(b) \quad h = 1 \text{ cm} \quad , \quad t = \frac{3}{\pi} \cos^{-1}\left(\frac{1}{7}\right) = 1.36 \text{ sec}$$

$$h = 3 \text{ cm} \quad , \quad t = \frac{3}{\pi} \cos^{-1}\left(\frac{3}{7}\right) = 1.08 \text{ sec}$$

$$h = 5 \text{ cm} \quad , \quad t = \frac{3}{\pi} \cos^{-1}\left(\frac{5}{7}\right) = 0.74 \text{ sec}$$

$$\begin{aligned} \text{(c)} \quad h = 1 \text{ cm} \quad , \quad t &= \frac{3}{\pi} \cos^{-1} \left(-\frac{1}{7} \right) = 1.64 \text{ sec} \\ h = 3 \text{ cm} \quad , \quad t &= \frac{3}{\pi} \cos^{-1} \left(-\frac{3}{7} \right) = 1.92 \text{ sec} \\ h = 5 \text{ cm} \quad , \quad t &= \frac{3}{\pi} \cos^{-1} \left(-\frac{5}{7} \right) = 2.26 \text{ sec} \end{aligned}$$

$$17 \quad \text{(a) period} = 2\pi$$

$$\text{Amplitude} = 4$$

$$\text{(b) Maximum value(s)} \Rightarrow \theta = 0, \pi, 2\pi$$

$$\text{Minimum value(s)} \Rightarrow \theta = \frac{\pi}{2}, \frac{3\pi}{2}$$

$$\text{Zero(s)} : \theta = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$$

$$18. \quad \text{(a) } 1$$

$$\text{(b) } 2\pi$$

$$\text{(c) } 2$$

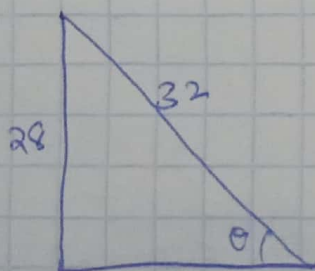
$$19. \quad 1 + \cot^2 \theta = \csc^2 \theta$$

$$\frac{1 + \cos^2 \theta}{\sin^2 \theta}$$

$$\frac{\sin^2 \theta + \cos^2 \theta}{\sin^2 \theta} = \frac{1}{\sin^2 \theta}$$

$$= \csc^2 \theta$$

20.



$$\sin \theta = \frac{28}{32}$$

$$\theta = \sin^{-1} \left(\frac{28}{32} \right) = 61^\circ$$