Name: SOLUTIONS

TICKET-IN-THE-DOOR

In order to be prepared for class you must watch the module and complete the following activity. This is due first thing when you get to class.

Given the nonzero constants A, B, h and k the graph of the function
$$y = A \sin(B(t-h)) + k$$

h = horizontal shift (how much the graph has shifted to right or left)

K = midline (Vertical Shift) Average of max & min

Describe in words and with A, B, h and k, the amplitude, period, horizontal shift and midline.

A = Vertical stretch/compression (Amplitude = the vertical distance between the max & midline)

Check your understanding:

B = Horizontal stretch/compression (Angular frequency which helps us find the period. $P = \frac{2\pi}{B}$)

1. What is the period of $y = 5\sin(8t - 4) + 7$?

$$y = 5\sin\left(8\left(t - \frac{1}{2}\right)\right) + 7 \Rightarrow P = \frac{2\pi}{|B|} = \frac{2\pi}{|8|} = \frac{2\pi}{8} = \boxed{\frac{\pi}{4}}$$

2. What is the amplitude of $y = 8\cos(3t + 15) - 6$?

Sol. $y = 8\cos(3(t+5)) - 6 \Rightarrow$ Amplitude $= |8| = \boxed{8}$

3. Find the horizontal shift of the sinusoidal function $y = -4\sin(13t + 11) - 2$.

Sol. $y = -4\sin(13(t + 11/13)) - 2 \Rightarrow$ Horizontal Shift left by $\frac{11}{13}$ units

4. Find the midline of the function $y = \frac{6\cos(6t) - 7}{2}$.

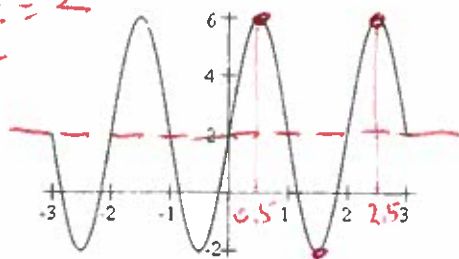Sol. $y = \frac{6\cos 6t}{2} - \frac{7}{2} = 3\cos(6t) - \frac{7}{2} \Rightarrow$ Midline: $y = -\frac{7}{2}$

5. The formula for the following trigonometric function is $f(t) = \underline{4}\sin(\underline{1}\pi t) + \underline{2}$.

Midline: $\frac{6 + (-2)}{2} = \frac{4}{2} = 2$

$\boxed{y = 2}$

Amplitude $\boxed{4}$

Period: 2

$P = \frac{2\pi}{B}$

$2 = \frac{2\pi}{B}$

$2B = \frac{2\pi}{2} \cdot 2 \Rightarrow 2B = 2\pi \cdot ... \Rightarrow \boxed{B = \pi}$

6. Find the phase shift of the sinusoidal function $y = 10\sin(8(t + 3))$

Sol. $y = 10\sin(8t + 24) \Rightarrow$ phase shift $= 24$

7. Describe how to obtain the graph of $y = \sin(5t + 20) - 7$ from the graph of $y = \sin(5t)$?

Sol. From graph of $y = \sin(5t)$, $y = \sin(5(t+4)) - 7$

(i) Horizontal Shift left by 4.

(ii) Vertical shift down by 7.
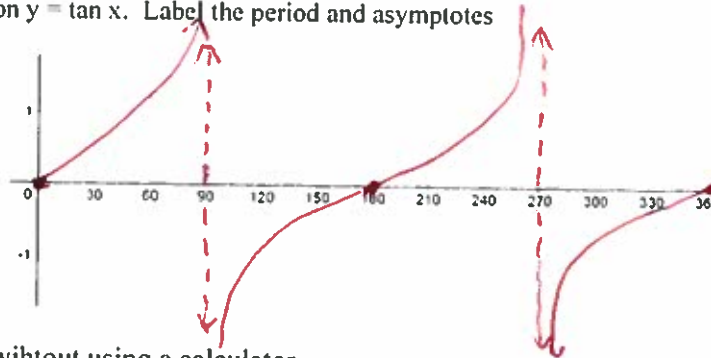
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TICKET-IN-THE-DOOR

In order to be prepared for class you must watch the module and complete the following activity. This is due first thing when you get to class.

Write domain and range for the following.
- $y = \sin x$ DOMAIN: All Reals. Range: $-1 \le y \le 1$
- $y = \cos x$ DOMAIN: All Reals. Range: $-1 \le y \le 1$
- $y = \tan x$ DOMAIN: All Reals except odd multiples of $\frac{\pi}{2}$. Range: All Reals

Check your understanding:

1. Graph the function $y = \tan x$. Label the period and asymptotes

2. Evaluation wihtout using a calculator.
   a. $\cos 90° = 0$

   b. $\tan 90° = $ UNDEFINED.

   c. $\cos 540° = -1$

   $\left(\frac{\sqrt{3}}{2}, \frac{-1}{2}\right)$ d. $\tan(-30)° = \frac{-1}{2} \cdot \frac{2}{\sqrt{3}} = \frac{-1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \boxed{\frac{-\sqrt{3}}{3}}$

3. Find the slope of the line passing through the origin at an angle $5\pi/8$.

   Sol $\tan \frac{5\pi}{8} = \boxed{-2.4142}$

4. Find the slope of the line passing through the origin at an angle $35°$.

   Sol $\tan 35° = \boxed{0.7002}$

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TICKET-IN-THE-DOOR

In order to be prepared for class you must watch the module and complete the following activity. This is due first thing when you get to class.

Make sure you have your Summary of Trig Relationships handy.

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \; ; \; \sec\theta = \frac{1}{\cos\theta}$$

$$\csc\theta = \frac{1}{\sin\theta} \; ; \; \cot\theta = \frac{1}{\tan\theta}$$

Check your understanding:

1. Find the exact values of the following without a calculator.

   a. $\tan\frac{2\pi}{3}$ = $\dfrac{\sin 2\pi/3}{\cos 2\pi/3}$ = $\dfrac{\sqrt{3}/2}{-1/2}$ = $\boxed{-\sqrt{3}}$

   b. $\cot\frac{\pi}{4}$ = $\dfrac{\cos\frac{\pi}{4}}{\sin\frac{\pi}{4}}$ = $\boxed{1}$

   c. $\sec\frac{11\pi}{6}$ = $\dfrac{1}{\cos\frac{11\pi}{6}}$ = $\dfrac{1}{\frac{\sqrt{3}}{2}}$ = $\dfrac{2}{\sqrt{3}}\cdot\dfrac{\sqrt{3}}{\sqrt{3}}$ = $\boxed{\dfrac{2\sqrt{3}}{3}}$

2. Show $\sin t = \cos\left(\frac{\pi}{2} - t\right)$

Sol = Since cosine is an even function, $\cos(t) = \cos(-t)$

$$\cos\left(-\left(\tfrac{\pi}{2}-t\right)\right) = \cos\left(-\tfrac{\pi}{2}+t\right) = \cos\left(t-\tfrac{\pi}{2}\right) = \sin t.$$

3. Simplify $3\sin^2 8t + 2\cos^2 8t$.

Sol

$$\sin^2 8t + 2\sin^2 8t + 2\cos^2 8t$$
$$\sin^2 8t + 2(\sin^2 8t + \cos^2 8t)$$
$$\sin^2 8t + 2(1) = \boxed{\sin^2 8t + 2}$$

4. If $\frac{\pi}{2} \le \theta \le \pi$ and $\sin\theta = \frac{4}{5}$, find the exact value of
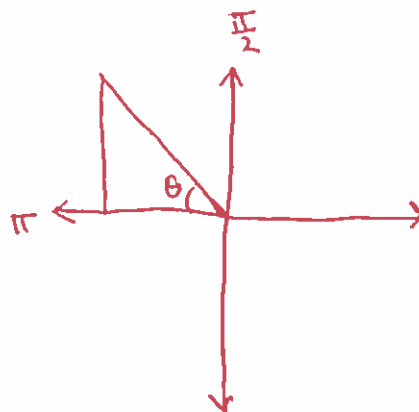
   a) $\cos\theta$ $\cos^2\theta + \sin^2\theta = 1$

                $\cos^2\theta + \left(\frac{4}{5}\right)^2 = 1$

   b) $\cot\theta$ $\cos^2\theta = 1 - \frac{16}{25}$

Sol $\cot\theta = \dfrac{\cos\theta}{\sin\theta}$ $\cos^2\theta = \frac{9}{25}$

$\cot\theta = -\dfrac{3}{5}\cdot\dfrac{5}{4}$ $\boxed{\cos\theta = -\dfrac{3}{5}}$

$\cot\theta = -\dfrac{3}{4}$

Name: **SOLUTIONS**

TICKET-IN-THE-DOOR

In order to be prepared for class you must watch the module and complete the following activity. This is due first thing when you get to class.

Check your understanding:

1. Solve the equation for a value of θ the first quadrant. Give your answer in both degrees and radians.

   a. $4\sin\theta = 1 \Rightarrow \sin\theta = \frac{1}{4} \Rightarrow \theta = \sin^{-1}\left(\frac{1}{4}\right) = \boxed{14.48°} \;\&\; \boxed{0.2527 \text{ radians}}$

   b. $6\cos\theta - 2 = 6 \Rightarrow 6\cos\theta = 8$
   $\cos\theta = \frac{8}{6} \Rightarrow \theta = \cos^{-1}\left(\frac{8}{6}\right) = \boxed{\text{No Solution}}$

   c. $\cos\theta + 4 = 5\cos\theta + 1$
   $\frac{4\cos\theta}{4} = \frac{3}{4} \Rightarrow \cos\theta = \frac{3}{4} \Rightarrow \theta = \cos^{-1}\left(\frac{3}{4}\right) = \boxed{41.41°} \;\&\; \boxed{0.7227 \text{ radians}}$

2. Use the inverse sine function to estimate the solution to the equation $\sin t = 0.4$ for $0 \le t \le \pi/2$.

   Sol $\sin t = 0.4$
   $t = \sin^{-1}(0.4) = \boxed{0.4115}$

3. Solve for θ, if $11\sin\theta - 2 = 2$ when $0 \le \theta \le \pi/2$. Give the answer correct to 3 decimal places.

   Sol $11\sin\theta - 2 = 2$
   $\underline{+2 \quad +2}$
   $11\sin\theta = 4$

   $\sin\theta = \frac{4}{11}$

   $\theta = \sin^{-1}\left(\frac{4}{11}\right) = \boxed{0.372}$

4. Solve for θ, when $0 \le \theta \le \pi/2$, if $5\cos(2\theta) + 7 = \cos(2\theta) + 8$. Give the answer correct to 3 decimal places.

   Sol $5\cos(2\theta) + 7 = \cos(2\theta) + 8$
   $\underline{-\cos(2\theta) - 7 \; - \cos(2\theta) - 7}$
   $\frac{4\cos(2\theta)}{4} = \frac{1}{4}$

   $\cos(2\theta) = \frac{1}{4}$

   $2\theta = \cos^{-1}\left(\frac{1}{4}\right)$

   $\theta = \frac{\cos^{-1}\left(\frac{1}{4}\right)}{2}$

   $\boxed{\theta = 0.659}$

Name: **SOLUTIONS**

TICKET-IN-THE-DOOR **SOHCAHTOA**

In order to be prepared for class you must watch the module and complete the following activity. This is due first thing when you get to class.

Check your understanding:

1. Consider the following figure

   a. Find a and b if $\sin A = 0.46$, and $c = 6$

   $\sin A = 0.46 \Rightarrow \frac{a}{c} = 0.46 \Rightarrow a = (6)(0.46) = \boxed{2.76}$

   $(2.76)^2 + b^2 = (6)^2$

   $c = 6 \quad b = \sqrt{(6)^2 - (2.76)^2}$

   $\boxed{b = 5.33}$

   b. Find a and c if $\cos A = 0.71$, and $b = 4$

   Sol $\cos A = 0.71 \Rightarrow \frac{4}{c} = 0.71 \Rightarrow \frac{c \cdot 0.71}{0.71} = \frac{4}{0.71} \Rightarrow c = \boxed{5.63}$

   $a = \sqrt{(5.63)^2 - (4)^2}$

   $= \boxed{3.96}$

   c. Find A°, B°, c if $a = 7$ and $b = 2$

   $(7)^2 + (2)^2 = c^2 \Rightarrow c = \sqrt{53}$

2. The grade of the road is 7.2%. What angle does the road make with the horizontal? Round your answer to 3 decimal places.

   Sol
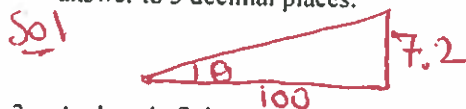
   $\tan\theta = \frac{7.2}{100} \Rightarrow \boxed{\theta = 4.118°}$

3. A plane is flying at an elevation of 35,000 feet when the Gateway Arch in St. Louis, Missouri comes into view. The pilot wants to estimate her horizontal distance from the arch, so she notes the angle of depression, 32°, between the horizontal and a line joining her eye to a point on the ground directly below the arch. Hint Label the following.
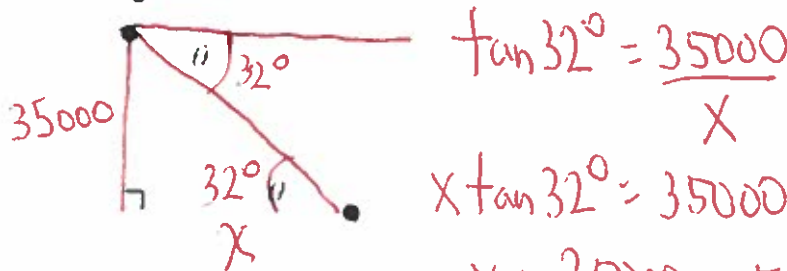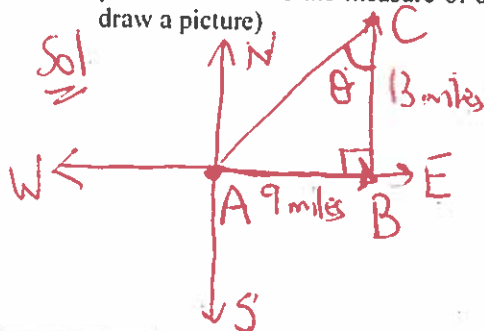
   $\tan 32° = \dfrac{35000}{X}$

   $X \tan 32° = 35000$

   $X = \dfrac{35000}{\tan 32°} = 56011.70 \, ft$

4. Kathleen starts at point A and walks 9 miles east to point B. Then, she walks 13 miles north to point C. What is the measure of angle ACB? Round to 2 decimal places. (You might want to draw a picture)

   Sol

   $\tan\theta = \frac{9}{13} \Rightarrow \theta = \tan^{-1}\left(\frac{9}{13}\right)$

   $\boxed{\theta = 34.70°}$

#1 (C) $\sin A = \dfrac{7}{\sqrt{53}} \Rightarrow A = \sin^{-1}\left(\dfrac{7}{\sqrt{53}}\right) = 74.05°$ | $\cos B = \dfrac{7}{\sqrt{53}} \Rightarrow \boxed{B = 15.95°}$