Classwork 7
Precalculus MTH 130
Instructor: Abhijit Champanerkar

Name: SOLUTIONS

1. Let $f(x) = \dfrac{2x^2 - 18}{x^2 - 4x - 5}$. $= \dfrac{2(x-3)(x+3)}{(x-5)(x+1)}$

a. Find the vertical and horizontal asymptotes. □

VA: $x = 5, x = -1$

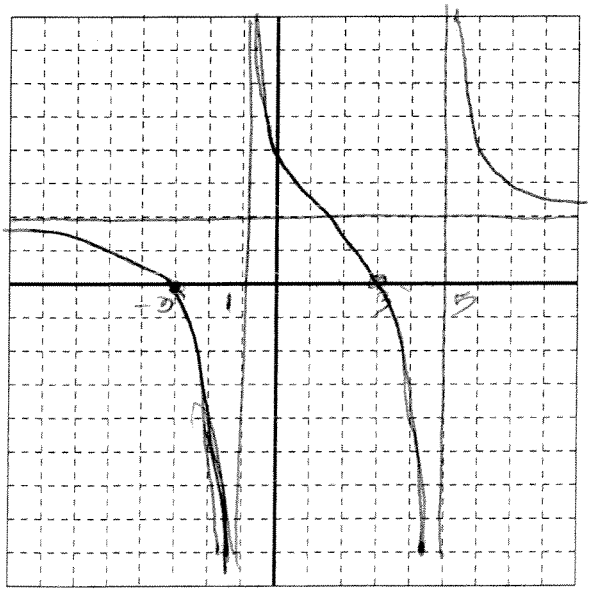
HA: $\dfrac{2x^2}{x^2} = 2 \Rightarrow y = 2$ HA.

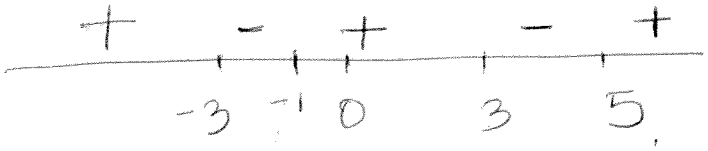
b. Find the intercepts. □

x-intercept $f(x) = 0$ $x = -3, 3$.

y-intercept $= f(0) = 18/5$.

c. Using test points and the above information, sketch the graph of $y = f(x)$. □





Classwork 8
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1. Fill in the following table.

θ	$0 = 0°$	$\pi/6 = 30°$	$\pi/4 = 45°$	$\pi/3 = 60°$	$\pi/2 = 90°$	$\pi = 180°$
$\sin\theta$	0	$1/2$	$\sqrt{2}/2$	$\sqrt{3}/2$	1	0
$\cos\theta$	1	$\sqrt{3}/2$	$\sqrt{2}/2$	$1/2$	0	-1
$\tan\theta$	0	$1/\sqrt{3}$	1	$\sqrt{3}$	∞	0

2. Convert from degree to radians: (a) $480° =$ $8\pi/3$ (b) $540° =$ 3π

3. Convert from radians to degrees: (a) $4\pi/3 =$ $240°$ (b) $7\pi/6 =$ $210°$

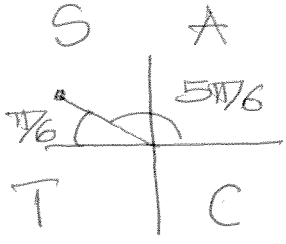
4. Find the reference angle and the terminal point on the unit circle determined by the real numbers:

(a) $t = -\pi/4$

$\bar{t} = \pi/4$

$P = (\sqrt{2}/2, -\sqrt{2}/2)$

(b) $s = 5\pi/6$



$P = (-\cos\pi/6, \sin\pi/6)$

$= (-\sqrt{3}/2, 1/2)$

Classwork 9
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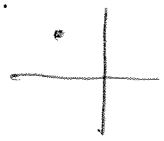
Name: SOLUTIONS

1. Find $P(x, y)$ on the unit circle if P is in the second quadrant and the y-coordinate is 3/7.



$y = 3/7$, $x^2 + y^2 = 1 \Rightarrow x^2 + \frac{9}{49} = 1$, $x^2 = 1 - \frac{9}{49} = \frac{40}{49}$

$x = \pm\frac{\sqrt{40}}{7}$

2nd quad $\Rightarrow$ $x = -\sqrt{40}/7$

$P = (-\sqrt{40}/7, 3/7)$

2. If $\cos t = 1/3$ and t is in quadrant IV, find the values of all the trignometric functions at t.

$\cos^2 t + \sin^2 t = 1$

$\frac{1}{9} + \sin^2 t = 1 \Rightarrow \sin^2 t = 1 - \frac{1}{9} = \frac{8}{9}$

$\sin t = \pm\frac{\sqrt{8}}{3}$

4th quad $\Rightarrow$ $\sin t = -\sqrt{8}/3$, $P = (\frac{1}{3}, -\sqrt{8}/3)$

3. Plot the graph $y = \sin x$ and $y = 3\sin(2x + \pi)$ on the samge graph below. Mark the points on the x-axis clearly.

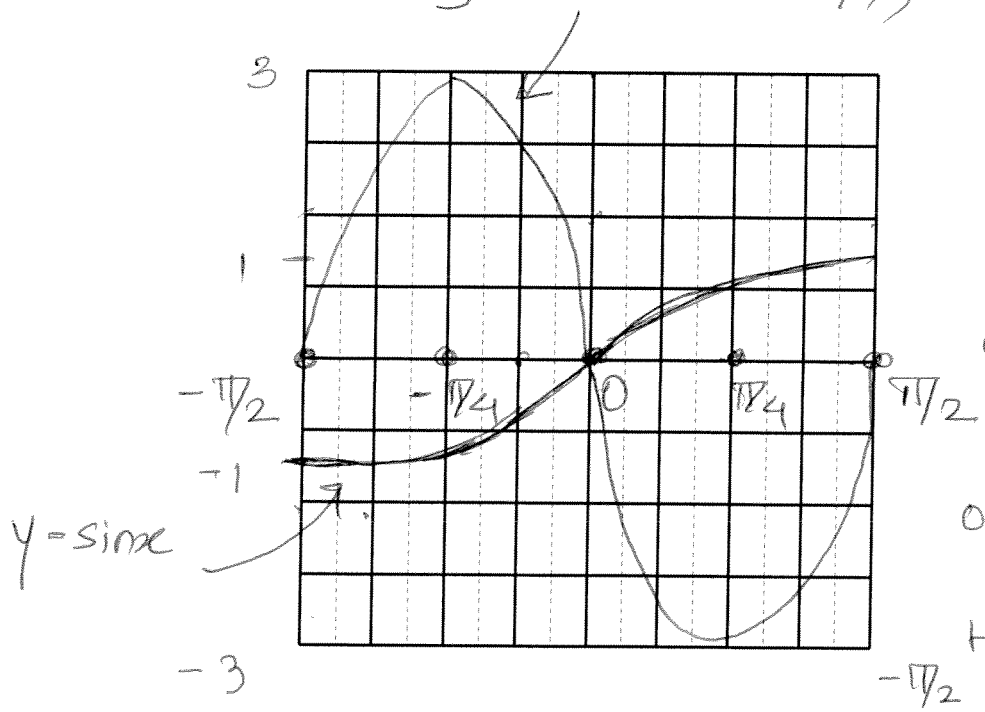
$y = 3\sin 2(x - (-\pi/2))$

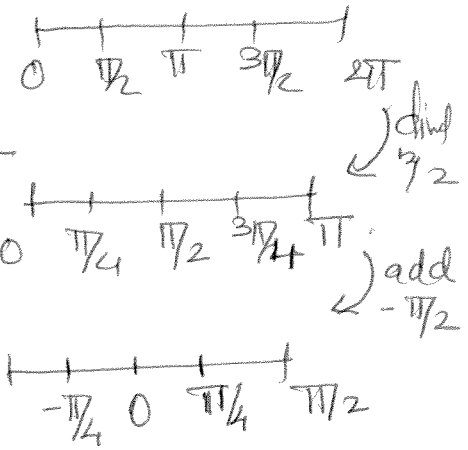
amp = 3

k = 2

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

phase shift $= -\pi/2$





Classwork 10

Precalculus MTH 130

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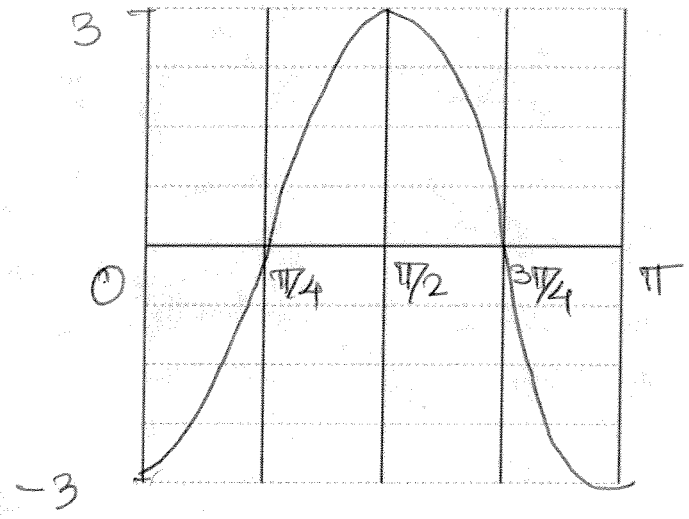
Name: SOLUTIONS

Find the amplitude, period, frequency and phase shift for the following functions. Plot them on the given grid by carefully choosing the scale on both the axes.

1. $y = -3\cos 2x$



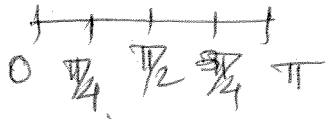
$k = 2$

Amplitude= 3

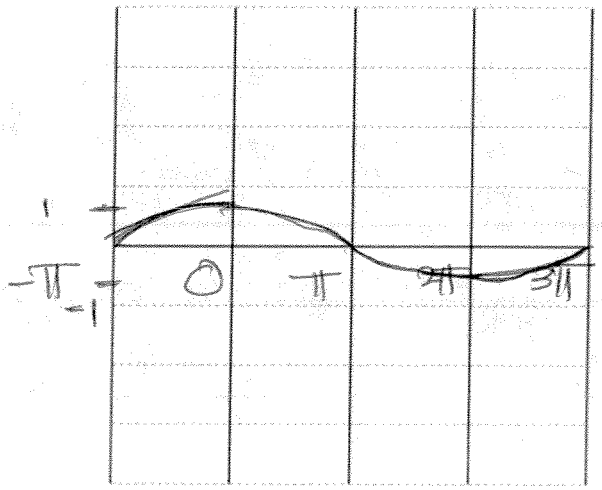
Period = $2\pi/2 = \pi$

Frequency = $1/\pi$

Phase shift = 0



2. $y = \sin\frac{1}{2}(x + \pi)$



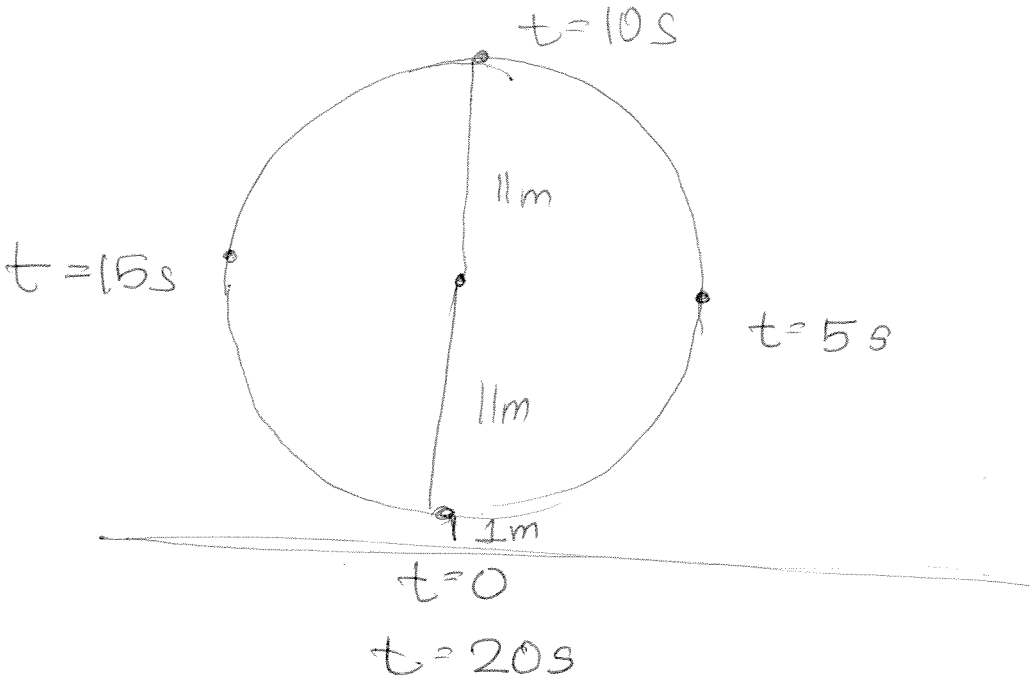
Amplitude= 1

Period = $2\pi/\frac{1}{2} = 4\pi$

Frequency = $1/4\pi$

Phase shift = $-\pi$

3. A ferris wheel has a radius of $11m$ and the bottom of the wheel passes $1m$ above the ground. If the ferris wheel makes one complete revolution every $20s$, find an equation that gives the height above the ground of a person on the ferris wheel as a function of time, assuming at $t = 0$ person starts at bottom (i.e. height $1m$). (Hint: draw pictures).



amp = 11m ,

period = time taken to complek one revolution

$= \frac{2\pi}{k} = 20s$

$t=0$, height = 1m,
starts at ~~bottom~~.

$\Rightarrow k = \frac{2\pi}{20} = \frac{\pi}{10}$.

$$y = -11\cos\left(\frac{\pi}{10}t\right) + 12$$

check: $t=0$, $y=1m$ ✓

$t=10$, $y=23m$. ✓

Classwork 11
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Name: SOLUTIONS

1. Convert from degree to radians: (a) 480° (b) 540° (c) 315° ☐

$480° = 8\pi/3$ rad, $540° = 3\pi$ rad

$315° = \frac{7\pi}{4}$ rad

2. Convert from radians to degrees: (a) $4\pi/3$ (b) $7\pi/6$ ☐

$\frac{4\pi}{3} = 240°$, $\frac{7\pi}{6} = 210°$

3. Find area of a sector of a circle with central angle 60° and radius 3 mi. ☐

$\text{Area} = \frac{1}{2}\theta r^2 = \frac{1}{2} \times \frac{\pi}{3} \times 3$

θ rad $= \frac{\pi}{2}$ mi^2

$60° = \pi/3$

4. A ceiling fan with 16 in blades rotates at 45 rpm. Find the angular speed of the fan in rad/min and the linear speed of the tip of the blade in in/min. ☐

$\omega = 45$ rpm $\Rightarrow \omega = 45 \times 2\pi$ rad/min $= 90\pi$ rad/min.

$r = 16$ in

$V = r\omega = 16 \times 90\pi$ in/min

$= 1440\pi$ in/min.

Classwork 12
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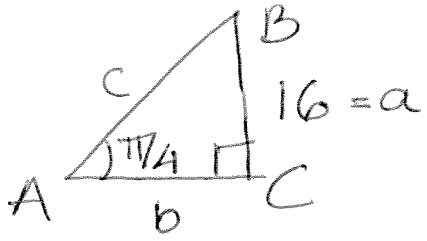
Name: _____

1. Solve the right triangle $\triangle ABC$ with $\angle C = \pi/2$, $\angle A = \pi/4$ and $|BC| = 16$. Draw a picture. □



$\angle B = \frac{\pi}{2} - \frac{\pi}{4} = \pi/4$

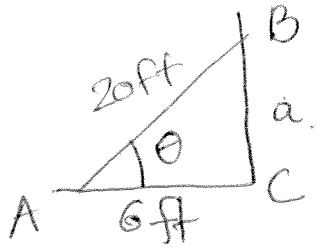
$\tan A = \frac{opp}{adj} = \frac{a}{b} = \frac{16}{b}$.

$\tan \pi/4 = 1 = \frac{16}{b} \Rightarrow b = 16$.

$c^2 = a^2 + b^2 = 16^2 + 16^2 = 256 + 256$
$= 512$

$c = \sqrt{512} = 16\sqrt{2} = 22.63$

2. A 20-ft ladder leans against a building so that the base of the ladder is 6-ft from the base of the building. What is the angle of elevation of the ladder ? How hig does the ladder reach on the building ? Draw pictures. □



$\cos\theta = \frac{adj}{hyp} = \frac{6}{20}$

θ is such that $\cos\theta = \frac{6}{20}$

$\theta = \cos^{-1} 6/20 = 1.27$ rad.

$\tan\theta = \frac{a}{6}$, $a = 6 \tan(1.27)$

$a = 19.08$.

~~The~~ ladder goes up to 19.08 ft.

angle of elevation = 1.27 rad.