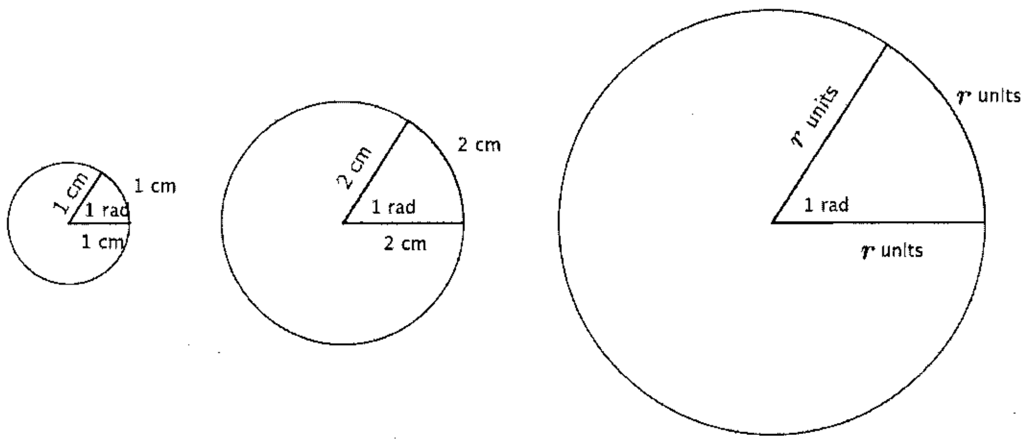
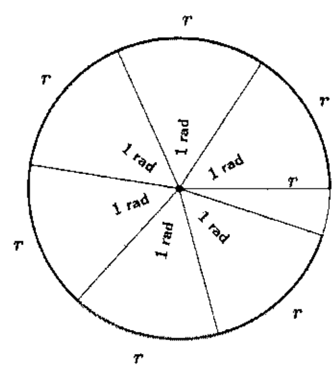
Advanced Algebra ¾ Name:________________

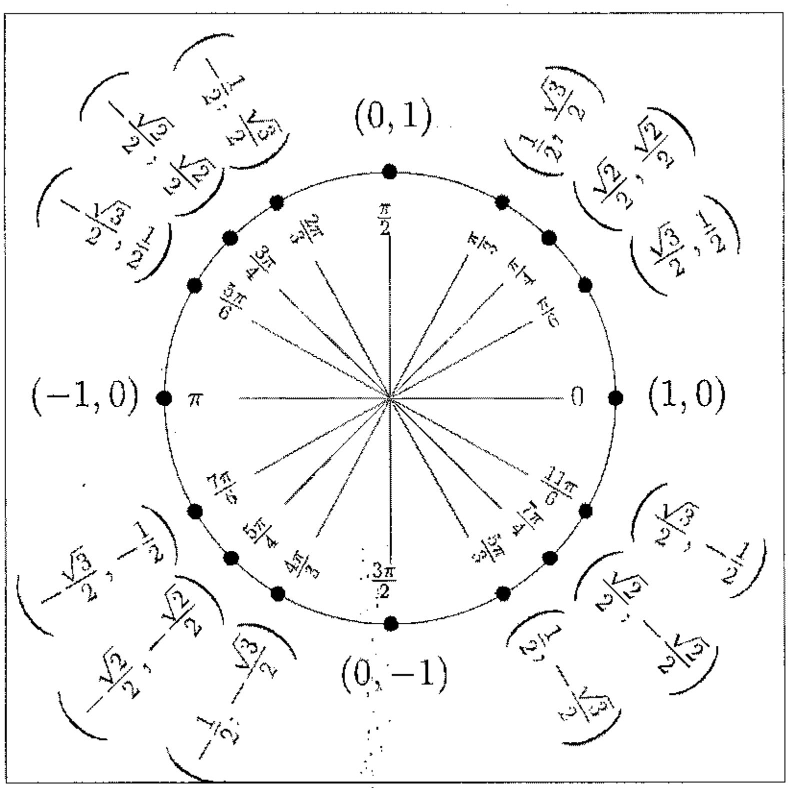
Radian Practice

- A circle is defined by a point and a radius. If we start with a circle of any radius and look at a sector of that circle with an arc length equal to the length of the radius, then the central angle of that sector is always the same size. We define a *radian* to be the measure of that central angle and denote it by $1\ rad$.



- Thus, a radian measures how far one radius will wrap around the circle. For any circle, it takes $2\pi \approx 6.3$ radius lengths to wrap around the circumference. In the figure, 6 radius lengths are shown around the circle, with roughly 0.3 radius lengths left over.





1. Complete the table below, converting from degrees to radians. Where appropriate, give your answers in the form of a fraction of π.

Degrees	Radians
$90° = 1/4$	$\pi/2$
$300° = 5/6$	$10\pi/6$
$-45° = -1/8$	$-\pi/4$
$-315° = -7/8$	$-7\pi/4$
$-690° = -11/12$	$-3\frac{5}{6}\pi$
$3\frac{3}{4}°$	$\pi/48$
$90\pi°$	$\pi^2/2$
$-\frac{45°}{\pi}$	$-1/4$

$\frac{3.75}{360} = .0104$

$.0104 \cdot 2\pi = \frac{1}{46}\pi$

$\frac{90\pi}{360} = \frac{\pi}{4}$

$\frac{\pi}{4} \cdot 2\pi = \frac{\pi^2}{2}$

$\frac{-45/\pi}{360} = -\frac{1}{8\pi}$

$-\frac{1}{8}\pi \cdot 2\pi = -\frac{1}{4}$

2. Complete the table below, converting from radians to degrees.

Radians	Degrees
$\frac{\pi}{4}$	$45°$
$\frac{\pi}{6}$	$30°$
$\frac{5\pi}{12}$	$75°$
$\frac{11\pi}{36}$	$55°$
$-\frac{7\pi}{24}$	-52.5
$-\frac{11\pi}{12}$	-165
49π	8820
$\frac{49\pi}{3}$	2940

$\frac{5\pi}{12} / 2\pi = \frac{5}{24}$

$\frac{5}{24} \cdot 360$

$\frac{11\pi}{36} / 2\pi = \frac{11}{72}$

$\frac{-7\pi}{24} / 2\pi = \frac{-7}{48}$

$\frac{-11\pi}{12} / 2\pi = \frac{-11}{24}$

$\frac{49\pi}{3} / 2\pi = \frac{49}{3}$

$\frac{49\pi}{2\pi} = 24.5$

3. Use the unit circle diagram from the end of the lesson and your knowledge of the six trigonometric functions to complete the table below. Give your answers in exact form, as either rational numbers or radical expressions.

θ	$cos(\theta)$	$sin(\theta)$
$\frac{\pi}{3}$	$1/2$	$\sqrt{3}/2$
$\frac{3\pi}{4}$	$-\sqrt{2}/2$	$\sqrt{2}/2$
$\frac{5\pi}{6}$	$-\sqrt{3}/2$	$1/2$
0	1	0
$-\frac{3\pi}{4}$	$-\frac{\sqrt{2}}{2}$	$-\frac{\sqrt{2}}{2}$
$-\frac{7\pi}{6}$	$-\frac{\sqrt{3}}{2}$	$1/2$
$-\frac{11\pi}{3}$	$1/2$	$\sqrt{3}/2$

4. Use the unit circle diagram from the end of the lesson and your knowledge of the sine, cosine, and tangent functions to complete the table below. Select values of θ so that $0 \leq \theta < 2\pi$.

θ	$cos(\theta)$	$sin(\theta)$
$\pi/3, 5\pi/3$	$\frac{1}{2}$	$\sqrt{3}/2, -\sqrt{3}/2$
$5\pi/4, 7\pi/4$	$-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}$	$-\frac{\sqrt{2}}{2}$
$3\pi/4$	$-\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$
π	-1	0
$3\pi/2$	0	-1
$7\pi/6, 11\pi/6$	$-\frac{\sqrt{3}}{2}, \sqrt{3}/2$	$-\frac{1}{2}$

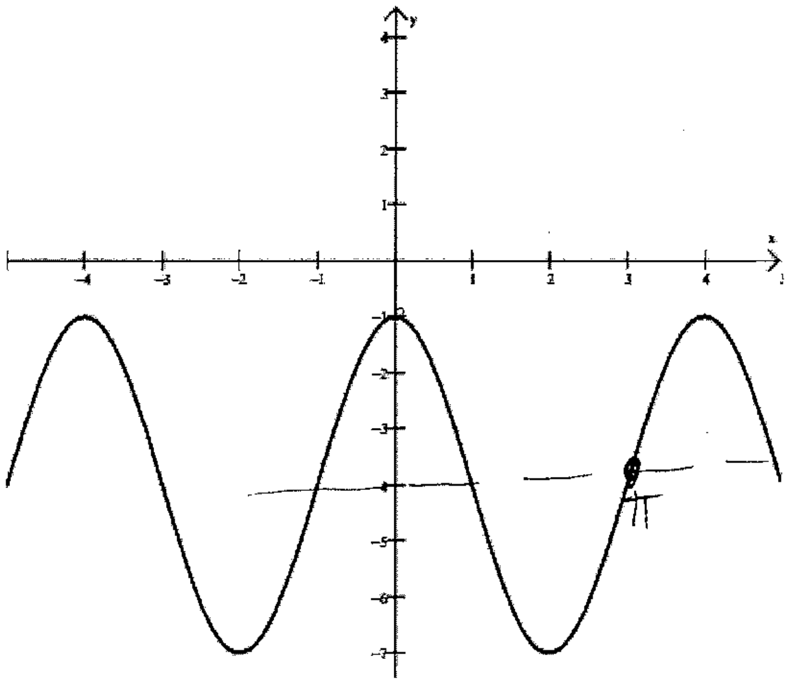
5. How many radians does the minute hand of a clock rotate through over 10 minutes? How many degrees?

$\frac{10}{60} = \frac{1}{6} \quad \frac{1}{6} \cdot 2\pi = \frac{\pi}{3} \quad \frac{1}{6} \cdot 360 = 60^\circ$

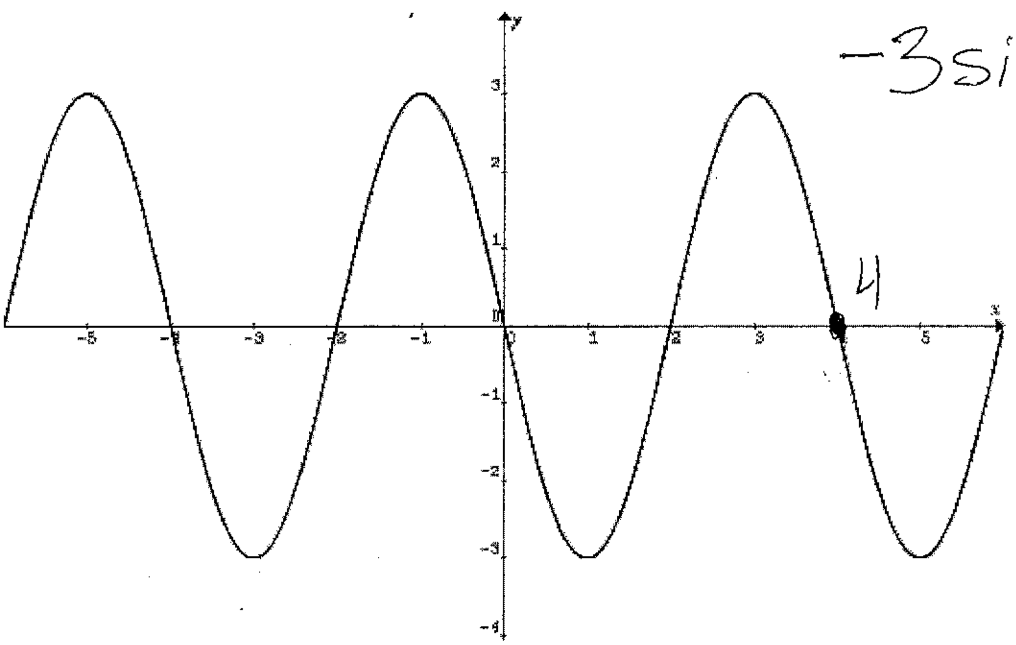
6. How many radians does the minute hand of a clock rotate through over half an hour? How many degrees?

$\frac{1}{2} \cdot 2\pi = \pi, \quad \frac{1}{2} \cdot 360 = 180^\circ$

Write the equation for each graph (in radians):



$3\cos(2x)-4$



$-3\sin\left(\frac{2\pi}{4}x\right)$