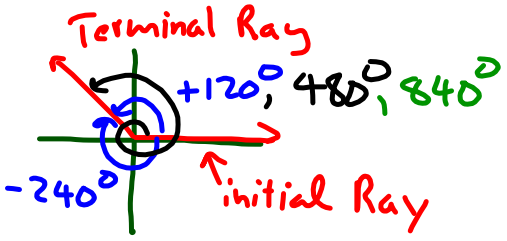
Section 4.2B: Coterminal Angles, Arc Length

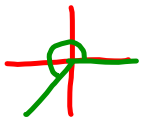
Coterminal Angles have the same starting and ending rays.

+/− angle

MJ multiple
TH revolutions
SW creates ∞ coterminal angles for any pair of rays.



Degrees: θ, $\theta + n360^\circ$, $n = \ldots -2, -1, 0, 1, 2, \ldots$

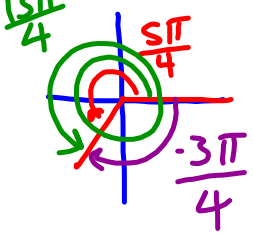


225°

$225^\circ + 360^\circ = 585^\circ$
$225^\circ + 2(360^\circ) = 945^\circ$
$225^\circ + -360^\circ = -135^\circ$

} coterminal angles

Radians: θ, $\theta + 2n\pi$



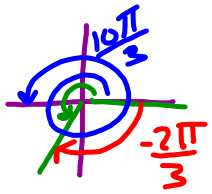
$\frac{5\pi}{4}$

$\frac{5\pi}{4} + \frac{8\pi}{4} = \frac{13\pi}{4}$ ($\div 2\pi$)

$\frac{5\pi}{4} + \frac{-8\pi}{4} = -\frac{3\pi}{4}$

Find and Draw 2 coterminal angles (1+, 1−) to the given angle

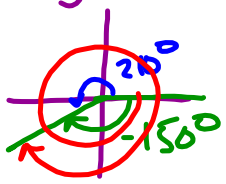
a) $\frac{4\pi}{3}$



$\frac{4\pi}{3} + \frac{6\pi}{3} = \frac{10\pi}{3}$

$\frac{4\pi}{3} + -\frac{6\pi}{3} = -\frac{2\pi}{3}$

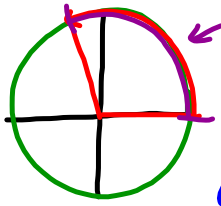
b) -150°



$-150^\circ + 360^\circ = 210^\circ$

$-150 + -360^\circ = -510^\circ$

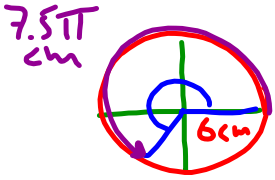
Arc Length $S = r\theta$



radius

central angle always in radians

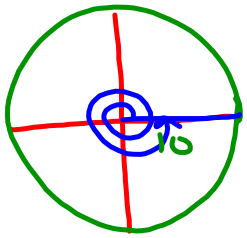
a) Find the length of the arc intercepted by a central angle of $\frac{5\pi}{4}$ with a radius of 6cm



$S = 6 \cdot \frac{5\pi}{4} = \frac{15\pi}{2}$ cm

$= 23.56$ cm

b) Find the length of the arc with $\theta = 720^\circ$ and a $r = 10$ m



$S = 10 \cdot 4\pi = 40\pi$ m

$= 125.7$ m

c) A truck has a wheel with a radius = 1 ft

How many miles will you travel in 1,000,000 rotations?

$S = r\theta$

$S = 1 \cdot 1{,}000{,}000 \cdot 2\pi$

$= 2{,}000{,}000\pi$ ft

≈ 1190 miles $= \frac{2{,}000{,}000\pi}{5280}$

p. 238; #18-33 all