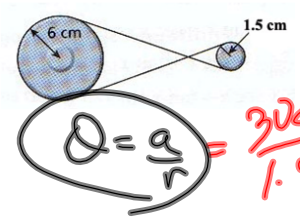
If the belt in the pulley system below travels 30 cm, what is the angle of rotation of the smaller pulley?



[A] $\frac{\pi}{9}$ radians [B] 20°

[C] 20 radians [D] 5°

$\theta = \frac{s}{r} = \frac{30cm}{1.5cm} = 20Rad$

Nibbles the hamster is running at 0.02 m/s on an exercise wheel of radius 8 cm. What is the angular velocity of this wheel?

[A] 0.15 rad/minute [B] 240 rad/minute [C] 0.25 rad/minute [D] 15 radians/minute

$V_A = \frac{\theta}{t}$

$ARL = 2cm/sec \quad \theta = \frac{2cm}{8cm} = 0.25Rad$

$V_A = \frac{0.25Rad}{1\,sec} \times \frac{60s}{1\,min} = 15Rad/min$

Solve: $2(1-\sin\theta)^2 + \sin\theta = 2(3-4\sin^2\theta)$, $-360° \le \theta \le 720°$

$M = \sin\theta$

$2(1-m)^2 + m = 2(3-4m^2)$

$2(1-2m+m^2) + m = 6-8m^2$

$2-4m+2m^2+m = 6-8m^2$

$10m^2 - 3m - 4 = 0$

$10m^2 - 8m + 5m - 4 = 0$

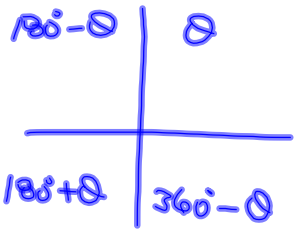
$2m(5m-4) + 1(5m-4) = 0$

$(5m-4)(2m+1) = 0$

$m = \frac{4}{5}$ OR $m = -\frac{1}{2}$

$\sin\theta = \frac{4}{5}$ $\sin\theta = -\frac{1}{2}$

(Ref 53°, Q1,2) (Ref 30°, Q3,4)



$\theta = 53°, 127°, 413°, 487°$ $\theta = 210°, 330°, 570°, 690°$

$-307°, -233°$ $-30°, -150°$

Little Johnny has a rock tied to the end of a piece of rope 1.5 m long and he is swinging it around his head in a circular pattern. Mrs. Centripetal, his physics teacher, is watching Johnny out the window of her physics lab and notes that the rock is making 12 revolutions every 48 seconds.

(a) Determine the angular velocity with which little Johnny is twirling the rope above his head. [2]

$12\,Rev = 12(2\pi)\,Rad = 24\pi\,Rad$

$V_A = \frac{24\pi\,Rad}{48\,Sec} = 1.571\,Rad/Sec$

(b) The rock comes flying from the rope 3 minutes after Mrs. Centripetal started to time little Johnny. How far did the rock travel during the 3 minutes? [2]

Angle of Rotation after 3 minutes: $\theta = 1.571\,\frac{Rad}{Sec} \times 180\,Sec = 282.74\,Rad$

$\theta = \frac{a}{r}$

$(1.5)\,282.74\ldots = \frac{a}{1.5m}\,(1.5)$

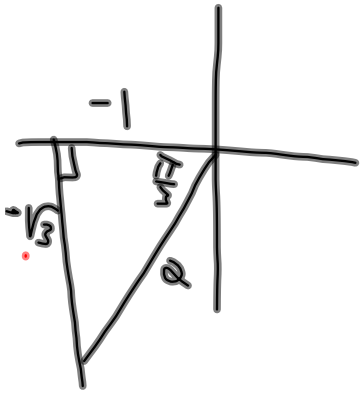
$424.115\,m = arc$

1. Without using a calculator, evaluate the following: **(Must include sketches)** [8]

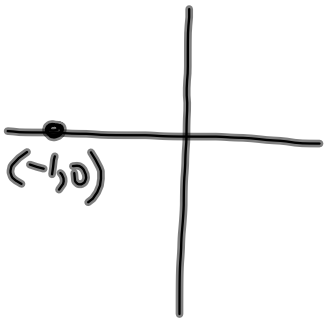
$$\csc\left(-\frac{20\pi}{3}\right)-\sec(17\pi)\cos^2\left(\frac{35\pi}{6}\right)-\cot\left(-\frac{45\pi}{4}\right)$$

$-\frac{20\pi}{3}=-\frac{21\pi}{3}+\frac{\pi}{3}$

$=-7\pi+\frac{\pi}{3}$

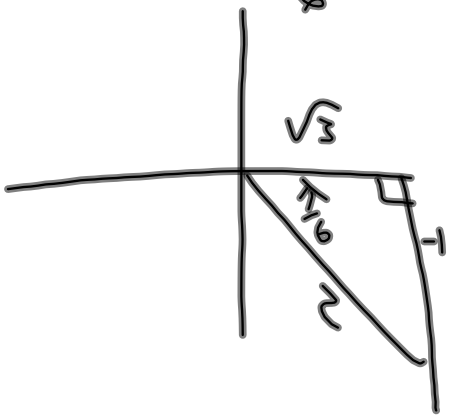


17π



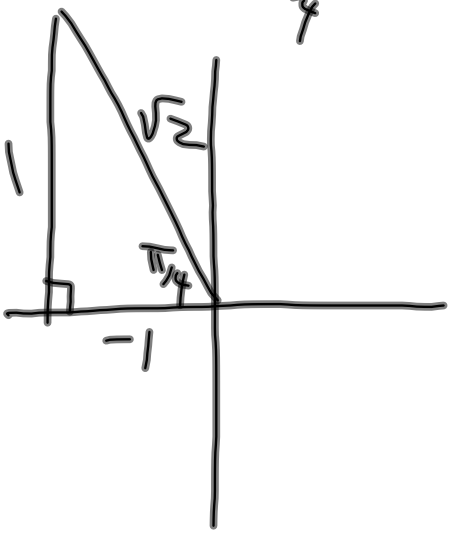
$\frac{35\pi}{6}=\frac{36\pi}{6}-\frac{\pi}{6}$

$=6\pi-\frac{\pi}{6}$



$-\frac{45\pi}{4}=-\frac{44\pi}{4}-\frac{\pi}{4}$

$=-11\pi-\frac{\pi}{4}$



$=\left(\frac{-2}{\sqrt{3}}\right)-(-1)\left(\frac{\sqrt{3}}{2}\right)^2-(-1)$

$=\frac{-2}{\sqrt{3}}+\frac{3}{4}+\frac{1}{1}$

$=-\frac{2}{\sqrt{3}}+\frac{7}{4}$ $\Rightarrow$ $\frac{}{4\sqrt{3}}+\frac{}{4\sqrt{3}}$

$=\frac{-8+7\sqrt{3}}{4\sqrt{3}}\left(\frac{\sqrt{3}}{\sqrt{3}}\right)$

$=\frac{-8\sqrt{3}+21}{12}$

$=\frac{21-8\sqrt{3}}{12}$

$$\cos\theta = 2\cos^2\theta, \quad -2\pi \le \theta \le 2\pi$$

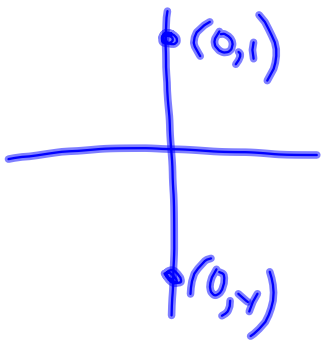
$2\cos^2\theta - \cos\theta = 0$

$\cos\theta(2\cos\theta - 1) = 0$

(x)

$\cos\theta = 0$ $\quad 2\cos\theta - 1 = 0$

$\cos\theta = \frac{1}{2}$



$\theta = \pm\frac{\pi}{2}, \pm\frac{3\pi}{2}$