Name _____ Date _____

Math 112: #2 A/B

1. Suppose Dr. Evil's spaceship is in lunarsynchronous orbit around the Moon. It remains above the same point on the moon's equator about 88, 000*km* above the surface. Assuming the radius of the moon is 1,737 *km*. Find the following. State the exact answer, then give a decimal answer rounded to ~~two~~ 4 decimal places.

a. The angular speed of the spaceship in radians per hour.

a moonday is ~ 27 earth days

$$\text{angular speed} = \omega = \frac{\theta}{t} = \frac{2\pi}{27 \cdot 24} = \frac{\pi}{27 \cdot 12} = \frac{\pi}{324} \text{ radians/hour}$$

$$\approx 0.0097 \text{ radians/hour}$$

$r_1 = 1737\,km$

$r_2 = 88{,}000\,km$

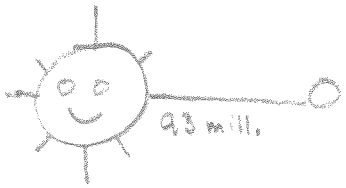
b. The linear speed of the spaceship in kilometers per hour.

$$\text{linear speed} = v = \frac{s}{t} \qquad \text{arc length } s = r\theta = (88{,}000 + 1{,}737)\,km \cdot 2\pi$$

$$v = \frac{179{,}474\pi\ km}{27 \cdot 24\ hr} = 276.97\pi\ km/hr$$

$$\approx 870.11\ km/hr$$

2. Find the distance that the earth travels in one day in its path around the sun. Assume that a year has 365 days and that the path of the earth around the sun is a circle of radius of 93 million miles. State the exact answer, then give a decimal answer rounded to two decimal places.



$S = r\theta$

$S = 93{,}000{,}000 \cdot 2\pi$ = distance/year

$\frac{S}{365}$ = distance/day = $\frac{93{,}000{,}000 \cdot 2\pi \text{ miles/year}}{365 \text{ days/year}}$

$= 509589.0411\,\pi$ miles/day

$= 1{,}600{,}921.19$ miles/day