Mth 112 Geometry, Algebra and Functions *Franz Helfenstein* Name

The purpose of this assignment is to review geometry, algebra and functions. You may work on separate paper but write your answers on this page. Answers must be **boxed or circled** and clearly **legible**. Where possible write answers as an **exact** value otherwise use **two** decimal accuracy. Leave π in answers where applicable. **Units** required.

Usually we recall the area of a circle as a function of the radius given by $A(r) = \pi r^2$.

1) Give the circumference as a function of the radius. $C(r)$ = ________________

2) Give the area as a function of the diameter. $A(d)$ = ________________

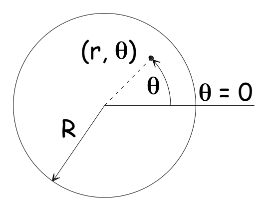
3) Give the area as a function of the circumference. $A(c)$ = ____________

4) Angular velocity is often represented by ω (little omega). Appropriate units might be rpm, deg/sec, rad/sec, etc. For a disk spinning at ω rpm convert the angular velocity to:

   (a) 60 rpm = _____________ deg/sec (b) 480 rpm = ________________ rad/sec

A disk of radius R spins at ω rpm. Let (r, θ) be a point on the disk as shown. This is called a polar coordinate as opposed to a rectangular (x,y) coordinate.

The point's linear velocity (v) is given by $v = \dfrac{\text{distance}}{\text{time}} = \dfrac{\text{circumference}}{\text{time of 1 rev}}$



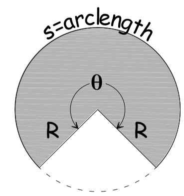
5) Give the linear velocity (fps) 1 ft from the center @ 480 rpm. v = __________
   Note: If an object let loose from this spot its velocity would be v.

6) Give v as a function of r @ 480 rpm. v(r) = ____________

7) At 480 rpm give elapsed θ (degrees) after 20 sec. θ = _____________

8) Give θ as a function of time @ 480 rpm. θ(t) = ______________

9) 's' (lower case) is commonly used to represent arc length. As a direct proportion we have:



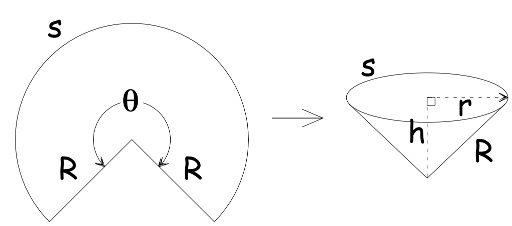
$$\frac{\text{part of circle degrees}}{\text{all of circle degrees}} = \frac{\text{part of circle circumference}}{\text{all of circle circumference}} \rightarrow \frac{\theta°}{360°} = \frac{s}{C}.$$ Replace C by $C(r)$ (see #1) and solve for 's' to obtain 's' as a function of r and θ°.

s(r, θ°) = ________________ Note: This formula requires θ be in degrees!

10) Give s as a function of r and θ when θ is in radians. s(r, θ) = ______________

BONUS

A drinking cup or ice cream cone can be made from the sector of a circle. See diagram. Clearly, the volume of the resulting cone depends on (is a function of) the radius of the original disk (R) and the degrees of the sector (θ).



The volume of the cone is $V = (\frac{1}{3})\, \pi\, r^2\, h$.

Find V(R, θ) =

What is the maximum volume of an ice cream cone when R = 6"?