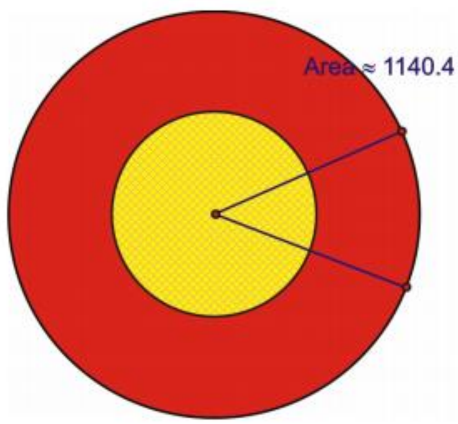
2.7 Graphing Tangent, Cotangent, Secant, and Cosecant

Test

1. $160° \cdot \frac{\pi}{180°} = \frac{16\pi}{18} = \frac{8\pi}{9}$
2. $\frac{11\pi}{12} \cdot \frac{180°}{\pi} = 11 \cdot 15° = 165°$
3. $\cos \frac{3\pi}{4} = \cos 135° = -\frac{\sqrt{2}}{2}$
4. For $\tan\theta = \sqrt{3}$, θ must equal 60° or 240°. In radians, $\frac{\pi}{3}$ or $\frac{4\pi}{3}$.
5. There are many difference approaches to the problem. Here is one possibility: First, calculate the area of the red ring as if it went completely around the circle:

$$A = A_{total} - A_{gold}$$
$$A = \pi\left(\frac{2}{3} \times 66 \times \frac{1}{2}\right)^2 - \pi\left(\frac{1}{3} \times 66 \times \frac{1}{2}\right)^2$$
$$A = \pi \times 22^2 - \pi \times 11^2$$
$$A = 484\pi - 121\pi = 363\pi$$
$$A \approx 1140.4\ in^2$$



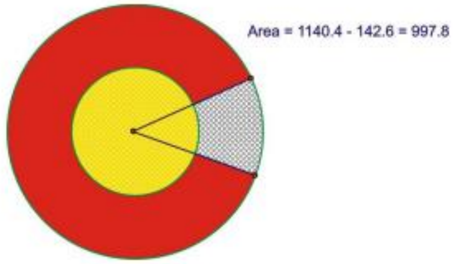
Next, calculate the area of the total sector that would form the opening of the "*c*"

$$A = \frac{1}{2}r^2\theta$$
$$A = \frac{1}{2}(22)^2\left(\frac{\pi}{4}\right)$$
$$A \approx 190.1\ in^2$$

Then, calculate the area of the yellow sector and subtract it from the previous answer.

$$A = \frac{1}{2}r^2\theta \rightarrow A = \frac{1}{2}(11)^2\left(\frac{\pi}{4}\right) \rightarrow A \approx 47.5\ in^2$$
$$190.1 - 47.5 = 142.6\ in^2$$

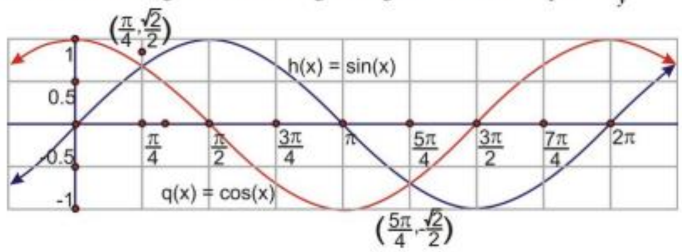
Finally, subtract this answer from the first area calculated. The area is approximately 998 in^2



6. Answers:

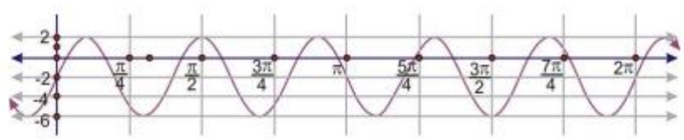
   a. First find the circumference: $2\pi \cdot 7 = 14\pi$. This will be the distance for the linear velocity. $v = dt = 14\pi \cdot 9 = 126\pi \approx 395.84\ cm/sec$
   b. $\omega = \frac{\theta}{t} = \frac{2\pi}{9} \approx 0.698\ rad/sec$

7. Given such a quadrilateral, and given that the two transverse angles are identified as equal (i.e., both are marked as θ in the picture), the orange segment must be parallel to the opposite (pink) radius segment, and this quadrilateral would have to be a square. This means that θ must be equal to 45 degrees, and both the tangent and cotangent of 45 degrees are equal to 1. Also, since the radii of the circle are equal to 1 unit, each of the sides of the quadrilateral (including the cotangent segment) are equal to 1 unit. Therefore, since $\cot\theta = \frac{x}{y}$, the number of units that is the length of the cotangent segment must be equal to $\frac{x}{y}$.

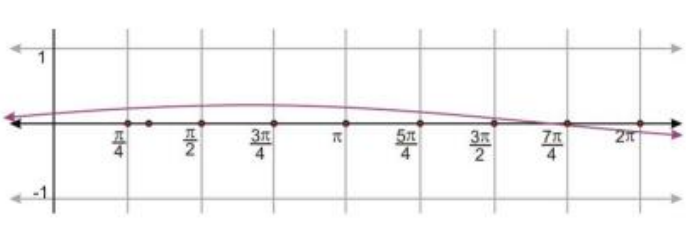
8. 

The intersections are $\left(\frac{\pi}{4}, \frac{\sqrt{2}}{2}\right)$ and $\left(\frac{5\pi}{4}, -\frac{\sqrt{2}}{2}\right)$.

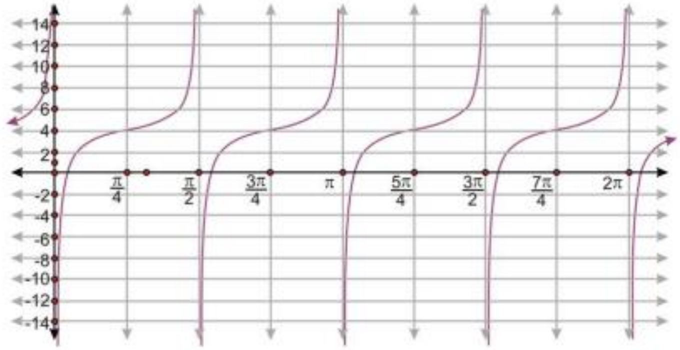
9. $y = -2 + 4\sin 5x, A = 4, B = 5, p = \frac{2\pi}{5}, C = 0, D = -2$



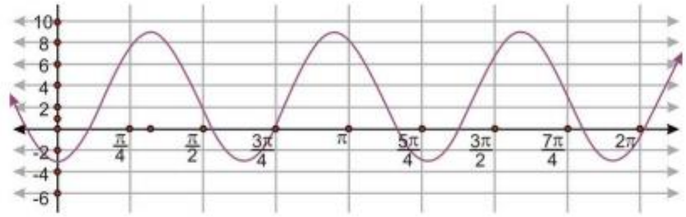
10. $f(x) = \frac{1}{4}\cos\left(\frac{1}{2}\left(x - \frac{\pi}{3}\right)\right), A = \frac{1}{4}, B = \frac{1}{2}, p = 4\pi, C = \frac{\pi}{3}, D = 0$



11. $g(x) = 4 + \tan\left(2\left(x + \frac{\pi}{2}\right)\right), A = 1, B = 2, p = \frac{\pi}{2}, C = \frac{-\pi}{2}, D = 4$



12. $h(x) = 3 - 6\cos(\pi x), A = -6, B = \pi, C = 0, D = 3$



13. $y = -1 + \frac{1}{2}\cos 3x$
14. $y = \tan 6x$