

Chapter 10 Test April 8, 2008 No Calculators Name

1. Find the equation of the normal line to the curve if $x = \sin^2 t$, $y = \cos 2t$ where $t = \frac{7\pi}{6}$

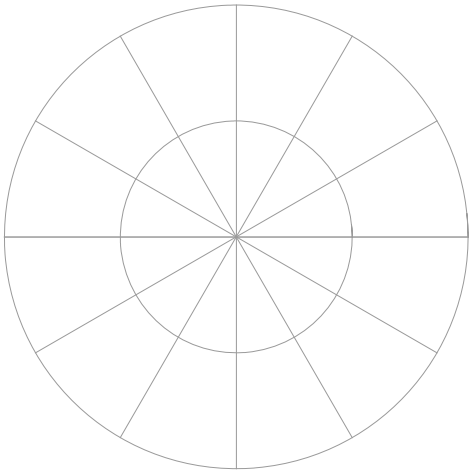
2. If $x = e^{-t}$ and $y = e^{2t}$, then find $\frac{d^2 y}{dx^2}$ in terms of t , and discuss the concavity of this plane curve for $-\infty < t < \infty$

3. Find the length of the curve if $x = \ln(\cos t)$, $y = t$, and $0 \leq t \leq \frac{\pi}{3}$

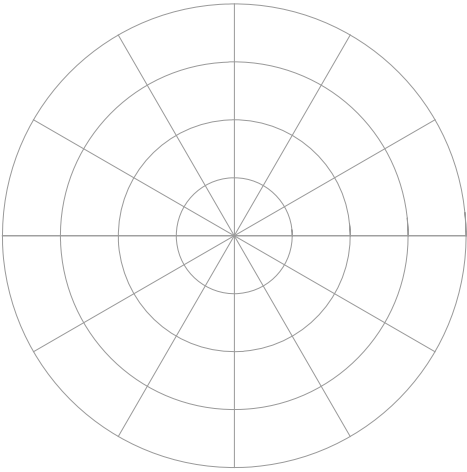
4. Solve the initial value problem $\frac{dr}{dt} = (\cot^2 t) i + \left(\frac{1}{2t\sqrt{t^2 - 1}}\right) j$ where $r(1) = \langle 0, 1 \rangle$

5. Find the unit vectors (four in all) that are tangent and normal to $x = 7t - t^3, \ y = 1 + t^2 - 5t,$ at $t = 1$

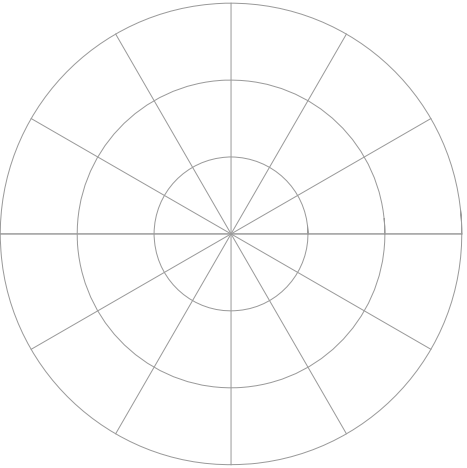
6. Find the slope of the tangent line for $r = 1 - \sin \theta,$ at $\theta = \frac{\pi}{2}.$



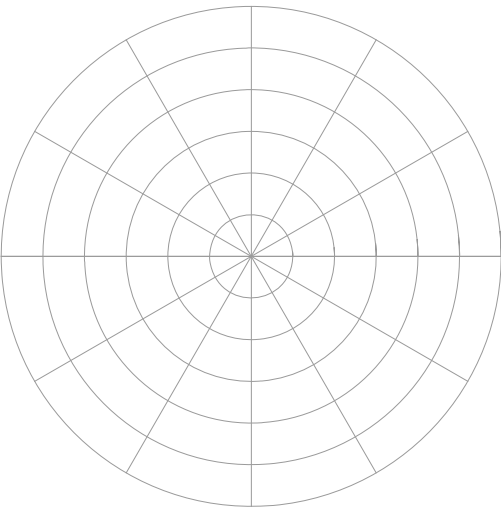
7. Sketch the graph of the polar equation, and be sure to label at least three polar points (r, θ) , if $r = -2 + \sqrt{3} \cos \theta$



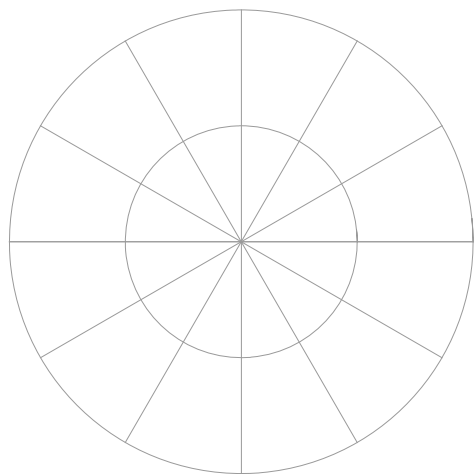
8. Find the area of the region that is inside both $r = \sqrt{2}$ and $r = -2 \sin \theta$



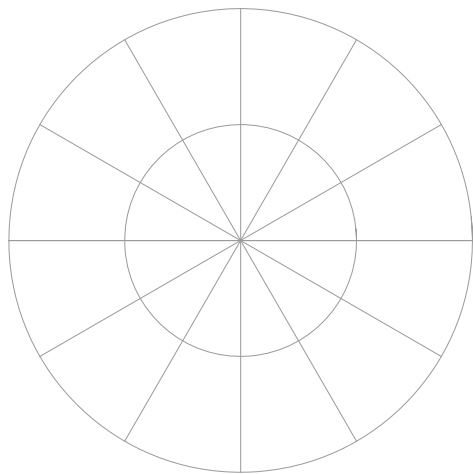
9. Find the area of the region that is inside $r = 6 \cos 2\theta$ and outside $r = 3$



10. Find the area of the region that is bounded by the small loop of the polar equation $r = \sqrt{2} - 2\cos\theta$



11. Find the length of the curve $r = e^{\frac{\theta}{2}}$ from $\theta = 1$ to $\theta = 2$



12. Find the angle between the velocity and acceleration vectors, for the given value of t if $\mathbf{r}(t) = (\sin t)\mathbf{i} + (2\cos t)\mathbf{j}$ at $t = \frac{\pi}{3}$ (Hint: $\theta = \cos^{-1}\left(\frac{\mathbf{v} \cdot \mathbf{a}}{|\mathbf{v}| |\mathbf{a}|}\right)$)