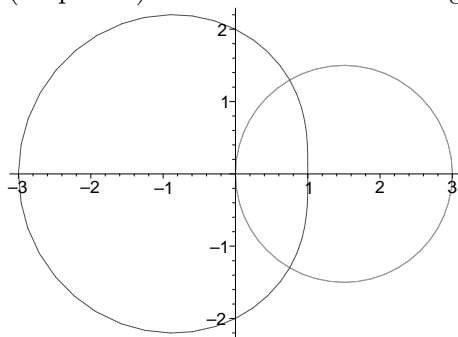


1. (20 points) For the curve $x = e^t - t, y = 4e^{t/2}, 0 \leq t \leq 1$,
 - (a) find an equation for the tangent line to the curve at the point when $t = 0$;
 - (b) find the length of the curve.

2. (20 points)
 - (a) Find the Cartesian coordinates of the point $(2, -3\pi/4)$ given in polar coordinates.
 - (b) Find a Cartesian equation for the curve $r = 3 \cos \theta$ given in polar equation.

3. (20 points) Find the limit of the following sequences as $n \rightarrow \infty$.
 - (a) $\left\{ \frac{\ln(n^2)}{n} \right\}$
 - (b) $\left\{ \frac{2n + (-1)^n \sin(n)}{n} \right\}$

4. (20 points) Find the area of the region that lies outside $r = 2 - \cos \theta$ and inside $r = 3 \cos \theta$.



5. (20 points)
 - (a) Find if the infinite series $\sum_{n=1}^{\infty} \frac{1}{n \ln n}$ converge or diverge. Explain why. (Hint: you can use integral test.)
 - (b) Find if the infinite series $\sum_{n=1}^{\infty} \frac{(-1)^n \ln n}{\sqrt{n}}$ converge absolutely, converge conditionally or diverge. Explain why. (Hint: you can use Alternating Series Test and Comparison Test.)

6. (Bonus: 20 points) Determine whether the sequence $\{\sqrt{2}, \sqrt{2\sqrt{2}}, \sqrt{2\sqrt{2\sqrt{2}}}, \dots\}$ converges or diverges. Find the limit if it converges.