1. Consider the curve \( \mathbf{r}(t) = \langle \sin(2t), -\cos(2t), 4t \rangle \).

   (a) Find the Frenet frame for \( \mathbf{r}(t) \) at the point \((0, 1, 2\pi)\).

   (b) Find the curvature \( \kappa(t) \) of \( \mathbf{r}(t) \).

   (c) The normal plane to a curve at a point \( P \) is the plane formed by the normal and binormal vectors at the point \( P \). Find an equation for the normal plane to the curve \( \mathbf{r}(t) \) at the points \((0, 1, 2\pi)\).
2. A particle has acceleration function \( \mathbf{a}(t) = (6t, 12t^2, \cos(2t)) \), with initial velocity \( \mathbf{v}(0) = (2, 0, 1) \), and initial position \( \mathbf{r}(0) = (0, 2, 0) \). Find the position of the particle at \( t = 2 \).

3. Show that the following limit does not exist.

\[
\lim_{(x,y)\to(0,0)} \frac{y^2 \sin^2 x}{x^4 + y^4}
\]
4. Match each function with its contour plot (level curves) below.

(a) \( f(x, y) = \sin(y) \) 
(b) \( f(x, y) = (x^2 - y^2)^2 \) 
(c) \( f(x, y) = 3 - x^2 - y^2 \) 
(d) \( f(x, y) = \sin(x) \sin(y) e^{-x^2-y^2} \) 
(e) \( f(x, y) = (x - y)^2 \) 
(f) \( f(x, y) = \frac{1}{1 + x^2 + y^2} \)