

Practice Midterm Examination Math 21C Fall 1999

1. We set $f(t) = \cos(4t)\cos(t)$ and $g(t) = \cos(4t)\sin t$ for $0 \leq t \leq 2\pi$. We will be considering the curve $x = f(t)$, $y = g(t)$.
 - a) Graph the curve.
 - b) Write out an integral that calculates the arc length of the curve.
 - c) Calculate the tangent line to the curve to the point $(-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}})$ on the curve.
2. Do the indicated calculations:
 - a) $\mathbf{a} \cdot \mathbf{b}$ and $|\mathbf{a} \times \mathbf{b}|$ if \mathbf{a} and \mathbf{b} are vectors such that $|\mathbf{a}| = 3$, $|\mathbf{b}| = 7$ and the angle between \mathbf{a} and \mathbf{b} is $\frac{3\pi}{4}$.
 - b) $\mathbf{a} \cdot \mathbf{b}$ and $\mathbf{a} \times \mathbf{b}$ if $\mathbf{a} = \langle 1, 3, 1 \rangle$ and $\mathbf{b} = 2\mathbf{i} - \mathbf{j} + \mathbf{k}$.
3. Draw the triangle in the x, y plane that has vertices $P(1, 2)$, $Q(3, 5)$ and $R(2, 4)$. Calculate its area.
4. Give parametric equations for the line through $P(1, 1, -1)$ in the direction $\mathbf{r} = 2\mathbf{i} + \mathbf{k}$. Find a normal vector to the plane containing this line and the point $Q(3, -1, 2)$.
5. Sketch the surface given by the equation $z = x^2 + y^2 - 2$.