

Pre-final quiz

Time: 1 hour

- (1) Consider the surface defined implicitly by

$$\cos^2(x + yz) = x + y + z$$

Find the equation of the tangent plane at $(1, -1, 1)$.

- (2) Find the critical points of the function
- $f(x, y) = 2x^3 + y^2 - 4x + 10xy$
- .

- (3) Let
- S
- be part of the sphere
- $x^2 + y^2 + z^2 = 2z$
- that lies inside the paraboloid
- $z = x^2 + y^2$
- .

(a) Find a parametric representation of S .(b) Find the surface area of S .

- (4) Let
- $\vec{F}(x, y, z) = \langle e^x, x^3/3 - z \cos(y^2), z \rangle$
- . Evaluate

$$\int_C \vec{F} \cdot d\vec{r}$$

where C is the curve given by the parametric equation $\vec{r}(t) = \langle \cos t, \sin t, 1 \rangle$ for $0 \leq t \leq 2\pi$.

- (5) Let
- E
- be solid region with
- $y \geq 0$
- bounded by the cylinder
- $x^2 + y^2 = 1$
- and the planes
- $z = 0$
- ,
- $z = x + 2$
- and
- $y = 0$
- . Find the flux

$$\iint_S \vec{F} \cdot d\vec{S}$$

across the boundary S of the region, with outward-pointing normals, where $\vec{F}(x, y, z) = \langle y^3 + e^z, \sin z + y, \cos(x^2) - y \rangle$.