

1. [EC 11.6, evens] Find the directional derivative of the function at the given point in the given direction  $\vec{v}$  or with the angle that  $\theta$  makes with the  $x$ -axis.
  - (a)  $f(x, y) = x \sin(xy)$  at  $(2, 0)$  with  $\theta = \pi/3$
  - (b)  $f(x, y, z) = x/(y + z)$ , at  $(4, 1, 1)$  with  $\vec{v} = \langle 1, 2, 3 \rangle$ .
2. [EC 11.6.18] Find the maximum rate of change of  $f(x, y, z) = \tan(x + 2y + 3z)$  at  $(-5, 1, 1)$  and the direction in which it occurs.
3. [EC 11.6.34] Find the equations of the tangent plane and normal line to  $yz = \ln(x + z)$  at  $(0, 0, 1)$ .
4. [EC 11.7.8] Find and classify the critical points of  $f(x, y) = 2x^3 + xy^2 + 5x^2 + y^2$ .
5. [EC 11.7.34] Find the points on the surface  $y^2 = 9 + xz$  that are closest to the origin.