

## Tangent planes and linearization

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1.
  - (a) Find the plane tangent to  $f(x, y) = \sqrt{xy}$  at  $(4, 9, 6)$ .
  - (b) Use this to approximate the value of  $f(4, 10)$ .
  - (c) If  $\sqrt{40} \approx 6.32$ , what is the approximate error of your estimation in part **1b**?
2.
  - (a) Find the linearization  $L(x, y)$  of  $f(x, y) = e^x \cos(xy)$  at the point  $(0, 0)$ .
  - (b) Use this to approximate the value of  $e \cos(1)$ .
  - (c) If  $e \cos(1) \approx 1.47$ , what is the approximate error of your estimation in part **2b**?
  - (d) Approximate the value of  $\sqrt{e} \cos(0.5)$ .
  - (e) If  $\sqrt{e} \cos(0.5) \approx 1.45$ , what is the approximate error in your estimation in part **2d**?
  - (f) Compare the errors you found in parts **2c** and **2e**. Which one is “better?” Explain why this would be expected.
3. Find an equation of the plane tangent to  $x^2 + y^2 + z^2 = 1$  at  $(1, 1, -1)$ .
4. Find an equation of the plane tangent to  $z^2 - x^2y^2 = 9$  when  $x = y = 2$ .
5. **Optional:** Discuss in your group what the “tangent object” would be to graph of a three variable function.