1–6 Find an equation of the tangent plane to the given surface at the specified point. #1 NA

1. $z = 4x^2 - y^2 + 2y$, $(-1, 2, 4)$ **4.** $z = y \ln x$, $(1, 4, 0)$

9–10 Draw the graph of f and its tangent plane at the given point. (Use your computer algebra system both to compute the partial derivatives and to graph the surface and its tangent plane.) Then zoom in until the surface and the tangent plane become indistinguishable. #9 NA

9. $f(x, y) = \dfrac{xy \sin(x - y)}{1 + x^2 + y^2}$, $(1, 1, 0)$

10. $f(x, y) = e^{-xy/10}(\sqrt{x} + \sqrt{y} + \sqrt{xy})$, $(1, 1, 3e^{-0.1})$

11–16 Explain why the function is differentiable at the given point. Then find the linearization $L(x, y)$ of the function at that point. #11 NA

11. $f(x, y) = x\sqrt{y}$, $(1, 4)$ **12.** $f(x, y) = x^3y^4$, $(1, 1)$

20. Find the linear approximation of the function $f(x, y) = \ln(x - 3y)$ at $(7, 2)$ and use it to approximate $f(6.9, 2.06)$. Illustrate by graphing f and the tangent plane.

24. The wind-chill index W is the perceived temperature when the actual temperature is T and the wind speed is v, so we can write $W = f(T, v)$. The following table of values is an excerpt from Table 1 in Section 15.1.

Wind speed (km/h)

Actual temperature (°C): T \ v	20	30	40	50	60	70
−10	−18	−20	−21	−22	−23	−23
−15	−24	−26	−27	−29	−30	−30
−20	−30	−33	−34	−35	−36	−37
−25	−37	−39	−41	−42	−43	−44

Use the table to find a linear approximation to the wind-chill index function when T is near −15°C and v is near 50 km/h. Then estimate the wind-chill index when the temperature is −17°C and the wind speed is 55 km/h.

25–30 Find the differential of the function.

25. $z = x^3 \ln(y^2)$ #25 NA **26.** $v = y \cos xy$

32. If $z = x^2 - xy + 3y^2$ and (x, y) changes from $(3, -1)$ to $(2.96, -0.95)$, compare the values of Δz and dz.

36. Use differentials to estimate the amount of metal in a closed cylindrical can that is 10 cm high and 4 cm in diameter if the metal in the top and bottom is 0.1 cm thick and the metal in the sides is 0.05 cm thick.

40. Four positive numbers, each less than 50, are rounded to the first decimal place and then multiplied together. Use differentials to estimate the maximum possible error in the computed product that might result from the rounding.