Calculus 3 Workbook

Linear approximation and linearization

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LINEAR APPROXIMATION IN TWO VARIABLES

■ 1. Find the linear approximation of the function at $(1,1)$ and use it to approximate $f(0.99,0.99)$. Compare it to the exact value of $f(0.99,0.99)$.

$$f(t,s)=\sqrt{3t^2+s^2}$$

■ 2. Calculate the percentage error of the linear approximation of the function at $f(0.9e,0.81)$. Use the initial point $(e,1)$.

$$f(x,y)=\ln\left(\frac{x^2}{y}\right)$$

■ 3. Find the linear approximation of the function at $(0,0)$ and use it to approximate $f(0.2,0.01)$. Round to two decimal places.

$$f(u,v)=3e^{2u-7v}$$

■ 4. Find the values of a and b and write down the linear approximation of the function at (a,b), given that $f_x(a,b)=-5$ and $f_y(a,b)=11$.

$$f(x,y)=x^2-3y^2-7x-y$$

5. Find $f_x(1,2)$ and $f_y(1,2)$, given that $f(1,2) = 5$, $L(1,2.1) = 5.5$, and $L(1.1,1.95) = 5.4$, where $L(x, y)$ is the linear approximation of $f(x, y)$ at $(1,2)$.

LINEARIZATION OF A MULTIVARIABLE FUNCTION

■ 1. Find the percentage error of the linear approximation of the function at $(3.2, -1.1, 0.8)$, if the initial point is $(3, -1, 1)$.

$$f(x, y, z) = 2xy^2z^3$$

■ 2. Find the linear approximation of the function at $(2, \pi/6, -\pi/6)$ and use it to approximate $R(2, 0.5, -0.5)$. Round to two decimal places.

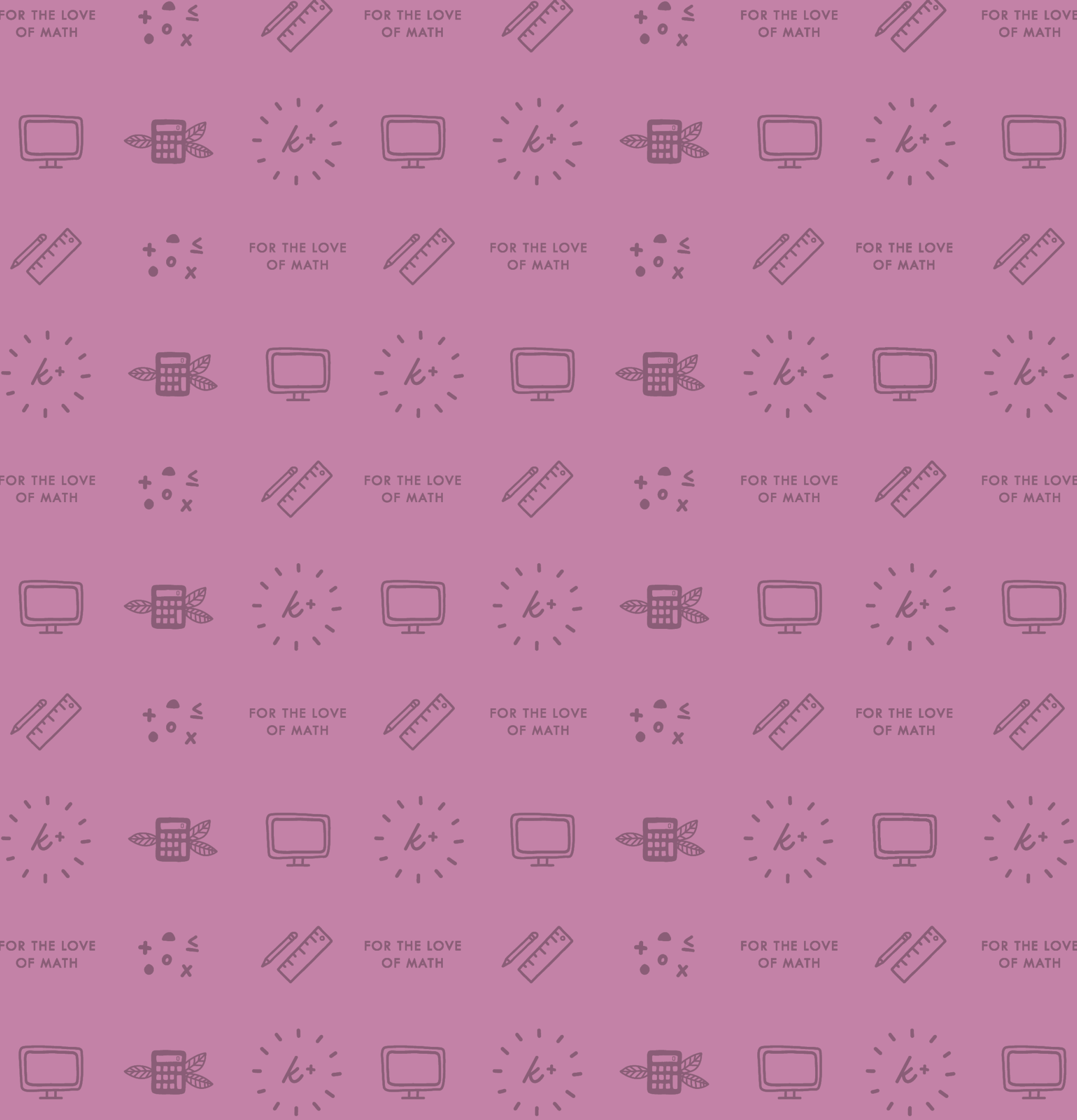
$$R(r, \phi, \theta) = r^2 \sin(2\phi)\cos(\theta + \pi)$$

■ 3. Find the values of the first order partial derivatives of $f(x, y, z)$ at $(3, 4, -8)$, where $L(x, y, z)$ is the linear approximation of the function $f(x, y, z)$ at $(3, 4, -8)$, and $f(3, 4, -8) = 3$.

$$L(3.1, 4.2, -8.1) = 3$$

$$L(3.2, 3.9, -7.8) = 3.4$$

$$L(2.9, 4.3, -8.1) = 2.8$$



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