
Complete the following problems. Show all work to receive full credit.

1. Find the linearization of $f(x) = \ln(1+x)$ at $x = 0$.

$$f(0) = \ln 1 = 0$$

$$f'(x) = \frac{1}{1+x}$$

$$f'(0) = \frac{1}{1+0} = \frac{1}{1} = 1$$

$$L(x) = f(0) + f'(0)(x - 0)$$

$$L(x) = 0 + 1(x - 0)$$

$$L(x) = x$$

2. Find the differential, dy , for each of the following:

(a) $y = xe^{-x}$

$$dy = (e^{-x} - xe^{-x}) dx$$

(b) $y = \ln\left(\frac{x+1}{\sqrt{x-1}}\right)$

$$y = \ln(x+1) - \ln\sqrt{x-1}$$

$$y = \ln(x+1) - \frac{1}{2}\ln(x-1)$$

$$dy = \left(\frac{1}{x+1} - \frac{1}{2} \cdot \frac{1}{x-1}\right) dx$$

$$dy = \left(\frac{1}{x+1} - \frac{1}{2(x-1)}\right) dx$$