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Quiz 3

1] $z = x^2 y$ $\quad x(1)=3 \quad x'(1)=5$ $\quad y(1)=1 \quad y'(1)=8$

$\left.\frac{dz}{dt}\right|_{t=1}$ $\qquad \frac{dz}{dx} = 2xy \qquad \frac{dx}{dt}$

$\frac{dz}{dy} = x^2$

$\frac{dz}{dt} = f_x \cdot x' + f_y \cdot y' = 2xy(5) + x^2(8)$

$x(1)=3 \rightarrow 2(3)1 = 6$

$y(1)=1 \rightarrow (1)^2 = 1$

$\left.\frac{dz}{dt}\right|_1 = 6(5) + 1(8) = \boxed{38}$

2] $f(x,y) = 5\sqrt{x+e^{3y}} - 1 \quad @ \ (3,0)$

$L(x,y) = f(3,0) + f_x(3,0)(x-3) + f_y(3,0)(y)$

$f_x(3,0) = 5\left(\frac{1}{2\sqrt{x+e^{3y}}}\right) = \frac{5}{2\sqrt{(3)+e^0}} = \frac{5}{4}$

$f_y(3,0) = 5\left(\frac{1}{2\sqrt{x+e^{3y}}}\right) \cdot 3e^{3y} = \frac{15}{4}$

$f(3,0) = 5\sqrt{3+e^{3(0)}} - 1 = 9$

$L(x,y) = 9 + \frac{5}{4}(x-3) + \frac{15}{4}y$

approx for $f(3.4, -0.2)$

$= 9 + \frac{5}{4}((3.4)-3) + \frac{15}{4}(-0.2) = \boxed{\frac{35}{4} = 8.75}$