Home work lecture $\boxed{1}$

$\boxed{1}$

(a) $f(x) = x^2 - x - 1$, $x_0 = 1$

$f'(x) = 2x - 1$

$x_{n+1} = 1 - \frac{-1}{1} = 2$

$\therefore x_2 = 2 - \frac{1}{3} = \frac{5}{3} = 1.666666$

$x_3 = 1.619048$

$x_4 = 1.618034$, $\boxed{x_5 = 1.618034}$ Solution

(b) $f(x) = x^3 - 7x^2 + 8x + 3$, $x_0 = 5$

$f'(x) = 3x^2 - 14x + 8$ $\boxed{x_n = 5.68577}$

$x_1 = 6$, $x_2 = 5.71875$, $\boxed{x_3 = 5.71825}$

(c) $f(x) = x\cos x - x^2$, $x_0 = 1$

$f'(x) = \cos x + (-x\sin x) - 2x$

$x_1 = x_0 - \frac{f(x)}{f'(x)} = 1 - \frac{f(1)}{f'(1)} = 0.8002329$

$x_2 = 0.\cancel{7}44094$

Solution is ~~0.744~~ 0.739085

Scanned with CamScanner

$\boxed{\text{Q3}}$

$\boxed{a}$ $f(x,y) = x^2 y \qquad (3,2)$

$\frac{\partial f}{\partial x}(x,y) = 2xy$ at $(3,2) = 12$

$\frac{\partial f}{\partial y}(x,y) = x^2 \to (3,2) = 9$

$\therefore$ The gradient is $(12, 9)$ $\begin{bmatrix} 12 \\ 9 \end{bmatrix}$

$\boxed{b}$ $f(x,y,z) = xy\,e^{x^2+z^2-5} \qquad (1,3,-2)$

$\frac{\partial f}{\partial x}(x,y,z) = (2x^2y+y)e^{x^2+z^2-5} \to (6+3)e^0 = 9$

$\frac{\partial f}{\partial y}(x,y,z) = x\,e^{x^2+z^2-5} \qquad = xe^0 = 1$

$\frac{\partial f}{\partial z}(x,y,z) = 2xyz\,e^{x^2+z^2-5} \qquad = 2xyz = -12$

$\therefore$ gradient $= (9, 1, -12)$

$$= \begin{bmatrix} 9 \\ 1 \\ -12 \end{bmatrix}$$