$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

1a/ $f(x) = x^5 + 3x^2 + x - 10$

$f'(x) = 5x^4 + 6x + 1$

b/ $x_1 = 1.25 - \frac{(1.25)^5 + 3(1.25)^2 + 1.25 - 10}{5(1.25)^4 + 6(1.25) + 1}$

$= 1.298811545$

$x_2 = 1.296399201$

$x_3 = 1.296392881$

$x_4 = 1.296392881$

$x = \underline{\underline{1.296}}$ 3dp

2/ $f(x) = \ln(2x+1) + x^2 - 5$

$f(1.8) = \ln(2(1.8)+1) + (1.8)^2 - 5 = -0.2339...$

$f(1.9) = \ln(2(1.9)+1) + (1.9)^2 - 5 = 0.1786...$

change of sign $\therefore$ root in interval $[1.8, 1.9]$

b/ $f'(x) = \dfrac{2}{2x+1} + 2x$

c/ $$x_1 = 1.8 - \frac{\ln(2(1.8)+1) + (1.8)^2 - 5}{\frac{2}{2(1.8)+1} + 2(1.8)}$$

$= \underline{1.858 \quad 3dp}$

3a/ $f(x) = x^3 + 3x^2 - 2x^{\frac{1}{2}}$

$f(0.6) = (0.6)^3 + 3(0.6)^2 - 2(0.6)^{\frac{1}{2}} = -0.253\ldots$

$f(0.7) = (0.7)^3 + 3(0.7)^2 - 2(0.7)^{\frac{1}{2}} = 1.396\ldots$

change of sign $\therefore$ root in interval $[0.6, 0.7]$

b/ $f'(x) = 3x^2 + 6x - x^{-\frac{1}{2}}$

c/ $x_1 = 0.65 - \dfrac{(0.65)^3 + 3(0.65)^2 - 2(0.65)^{\frac{1}{2}}}{3(0.65)^2 + 6(0.65) - (0.65)^{-\frac{1}{2}}}$

$\cancel{= 0.650}$

$= \underline{\underline{0.668}}$

4a/ $f(x) = \sin 2x + \ln x$

$f'(x) = 2\cos 2x + \frac{1}{x}$

stationary point where $f'(x) = 0$

$f'(1) = 2\cos(2) + \frac{1}{1} = 0.1677...$
$f'(1.1) = 2\cos(2.2) + \frac{1}{1.1} = -0.2679...$

change of sign $\therefore$ stationary point in interval $[1, 1.1]$

b/ $f'(x) = 2\cos 2x + x^{-1}$

$f''(x) = -4\sin 2x - x^{-2}$

$$x_1 = (1.05) - \frac{2\cos(2(1.05)) + (1.05)^{-1}}{-4\sin(2(1.05)) - (1.05)^{-2}}$$

$= 1.036854815$

$x_2 = 1.036966397$

~~$x_3 = 1.036966405$~~