1 a) $0 = \frac{1}{6}(3x^4 + 4x^3 - 12x^2) \quad | \cdot 6$

$0 = 3x^2(x^2 + \frac{4}{3}x - 4)$

$\Rightarrow \underline{\underline{x_{N_1} = 0}}$

$x^2 + \frac{4}{3}x - 4 = 0$

$x^2 + \frac{4}{3}x + (\frac{2}{3})^2 = 4 + (\frac{2}{3})^2 = 4 + \frac{4}{9} = \frac{40}{9}$

$(x + \frac{2}{3})^2 = \frac{40}{9} \quad | \sqrt{\ }$

$|x + \frac{2}{3}| = \frac{\sqrt{40}}{3}$ 3

$\Rightarrow x_{N2} = \frac{\sqrt{40}}{3} - \frac{2}{3} \quad \vee \quad x_{N3} = -\frac{\sqrt{40}}{3} - \frac{2}{3}$

$\underline{\underline{x_{N2} = 1{,}442}} \qquad \underline{\underline{x_{N3} = -2{,}775}}$

b) $f(x) = \frac{1}{2}x^4 + \frac{2}{3}x^3 - 2x^2$

$f'(x) = 2x^3 + 2x^2 - 4x$

$f''(x) = 6x^2 + 4x - 4$

$f'(x_E) = 0 = 2x_E^3 + 2x_E^2 - 4x_E$

$0 = 2x_E(x_E^2 + x_E - 2)$ 3

$0 = 2x_E(x_E + 2)(x_E - 1)$

$\Rightarrow \underline{x_E = 0} \quad \vee \quad \underline{x_E = -2} \quad \vee \quad \underline{x_E = +1}$

$f''(0) = 0 + 0 - 4 \qquad f''(-2) = 6 \cdot 4 - 8 - 4 \qquad f''(1) = 6 + 4 - 4 =$

$f''(0) = -4 < 0 \qquad f''(-2) = 12 > 0$ 5 $\qquad f''(1) = 6 > 0$

$\Rightarrow HP \qquad \Rightarrow TP \qquad \Rightarrow TP$

$f(0) = 0 \qquad f(-2) = \frac{1}{2} 16 - \frac{2}{3} \cdot 8 - 8 \qquad f(1) = \frac{1}{2} + \frac{2}{3} - 2$

$\underline{\underline{HP_{E1}(0|0)}} \qquad f(-2) = 8 - \frac{16}{3} - 8 \qquad f(1) = \frac{3 + 4 - 12}{6}$

$\underline{\underline{TP_1(-2|-\frac{16}{3})}}$ 5 $\qquad f(1) = -\frac{5}{6}$

$TP_2(1|-\frac{5}{6})$

c) $f'''(x) = 12x + 4$

$f''(x_w) = 0 = 6x_w^2 + 4x_w - 4 \quad | : 6$

$0 = x_w^2 + \frac{2}{3}x_w - \frac{2}{3}$

$\frac{2}{3} + \left(\frac{1}{3}\right)^2 = x_w^2 + \frac{2}{3}x_w + \left(\frac{1}{3}\right)^2$

$\frac{6+1}{9} = \left(x_w + \frac{1}{3}\right)^2 \quad \sqrt{}$

2

$\left|x_w + \frac{1}{3}\right| = \frac{\sqrt{7}}{3}$

$\Rightarrow x_{w_1} = -\frac{1}{3} + \frac{\sqrt{7}}{3} \quad \vee \quad x_{w_2} = -\frac{1}{3} - \frac{\sqrt{7}}{3}$

$x_{w_1} = 0{,}549 \qquad x_{w_2} = -1{,}215$

$f'''(0{,}549) = 12 \cdot 0{,}549 + 4 \qquad f'''(-1{,}215) = 12(-1{,}215) + 4$

$f'''(0{,}549) = 10{,}588 \neq 0 \qquad f'''(-1{,}215) = -10{,}58 \neq 0$

1 1

$f(0{,}549) = \ldots \qquad f(-1{,}215) = \ldots$

$f(0{,}549) = -0{,}447 \qquad f(-1{,}215) = 3{,}059$

$WP_1(0{,}549 | -0{,}447) \qquad WP_2(-1{,}215 | -3{,}059)$

d) streng monoton fallend $\quad -\infty < x < -2$; 1 $\; 0 < x < 1$

" " steigend $\quad -2 < x < 0$ 1 $\; 1 < x < \infty$

15P

② a) $f(0) = \ldots = 6$ $\quad \underline{\underline{S_y(0/6)}}$ ①

$f(2) = 8 - 4 - 10 + 6 = 0 \Rightarrow x_{N_1} = 2 \Rightarrow \underline{\underline{S_{x_1}(2/0)}}$

$$\begin{aligned}
&x_N^3 - x_N^2 - 5x_N + 6 : x_N - 2 = x_N^2 + x_N - 3 \\
&-(x_N^3 - 2x_N^2) \\
&\quad x_N^2 - 5x_N + 6 \\
&\quad -(x_N^2 - 2x_N) \\
&\qquad -3x_N + 6 \\
&\qquad -(-3x_N + 6) \\
&\qquad\quad 0
\end{aligned}$$

$x_N^2 + x_N - 3 = 0$

$x_N^2 + x_N + \left(\frac{1}{2}\right)^2 = 3 + \left(\frac{1}{2}\right)^2 = \frac{12}{4} + \frac{1}{4} = \frac{13}{4}$

$\left(x_N + \frac{1}{2}\right)^2 = \frac{13}{4} \quad |\sqrt{\ }$

③ $\quad \left|x_N + \frac{1}{2}\right| = \frac{\sqrt{13}}{2}$

$\Rightarrow x_N = -\frac{1}{2} + \frac{\sqrt{13}}{2} \quad \vee \quad x_N = -\frac{1}{2} - \frac{\sqrt{13}}{2}$

$x_{N_2} = 1{,}303 \qquad x_{N_3} = -2{,}303$

$\underline{\underline{S_{x_2}(1{,}303/0)}} \qquad \underline{\underline{S_{x_2}(-2{,}303/0)}}$

b) $f'(x) = 3x^2 - 2x - 5$

$f'(-3) = 3(-3)^2 - 2(-3) - 5 \qquad \underline{\underline{f'(-3) = 28}}$ ①

c) $f''(x) = 6x - 2$

$f''(x_w) = 0 = 6x_w - 2$

$\underline{x_w = \frac{1}{3}}$ ②

$f\left(\frac{1}{3}\right) = \left(\frac{1}{3}\right)^3 - \left(\frac{1}{3}\right)^2 - 5 \cdot \frac{1}{3} + 6$

$\underline{f\left(\frac{1}{3}\right) = 4{,}259}$

$f'''(x) = 6$

$f'''\left(\frac{1}{3}\right) = 6 \neq 0 \quad \Rightarrow \underline{\underline{WP\left(\frac{1}{3} / 4{,}259\right)}}$

d) $f_w(x) = mx + b$

$f'(\frac{1}{3}) = 3(\frac{1}{3})^2 - \frac{2}{3} - 5 = \underline{-5,\overline{3} = m}$

$f_w(\frac{1}{3}) = 4,259 = -5,\overline{3} \cdot \frac{1}{3} + b$

3

$\underline{b = 6,0367}$

$\underline{\underline{f_w(x) = -5,\overline{3} \cdot x + 6,0367}}$

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