Svar MVE340 2/6 -2017

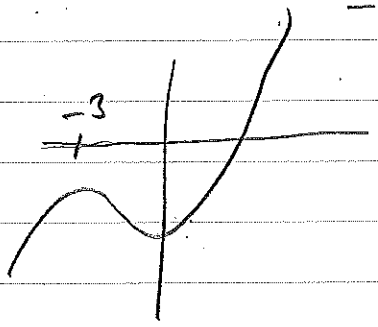
1a/ $f'(2) \approx -5$ $g(4.1) \approx 0.65$

1b/ $y = 1 - 4(x-1)$ $x = 5/4$

1c/ $f' = x(x-1)(x-2)$ — sign chart: $+$ on $x<0$, $-$ on $0<x<1$, $+$ on $1<x<2$, $-$ on $2<x$ resp $+$ on $x>2$

1d/ $f(0.7) \approx f(1) + \frac{f(0)-f(1)}{0-1}(0.7-1) = -1.7 + \frac{-0.8}{-1}\cdot(-0.3) = -1.94$

2a/ $6x^2 + 18x = 0$ — sign chart: $+$ on $x<-3$, $-$ on $-3<x<0$, $+$ on $0<x$



x	y
-3	-9
0	-36

2b/

x	y
1	-29
2	16

$x_0 = 1.5$

$x_1 = 1.72$ $f(x_1) = 0.91$

$x_2 = 1.704$ $f(x_2) = 0.007$ ok

2c/ $x^2 + 4 = 2x^2 + 3x$ $x = -\frac{3}{2} \pm \sqrt{\frac{9}{4}+4} = \begin{cases} -4 \\ 1 \end{cases}$

$$\int_{-4}^{1} (-x^2 - 3x + 4)\,dx = \left[-\frac{x^3}{3} - \frac{3x^2}{2} + 4x\right]_{-4}^{1} = \frac{125}{6}$$

3a/ $A - 4(Ax+B) = 5x - 3$ $A = -\frac{5}{4}$ $B = \frac{A+3}{4} = \frac{7}{16}$

3b/ $y' = -\frac{2}{5}y$ $y = Ce^{-\frac{2}{5}t}$ $y' = -\frac{2}{5}Ce^{-\frac{2}{5}t}$ $C = \frac{5}{2}$

3c/ $2r^2 + 10r + 13 = 0$ $r = -\frac{5}{2} \pm \frac{i}{2}$

$y = e^{(-5/2)t}\left(C_1 \cos\frac{t}{2} + C_2 \sin\frac{t}{2}\right)$

$y' = -\frac{5}{2}e^{-\frac{5}{2}t}(\quad) + \frac{1}{2}e^{-\frac{5}{2}t}\left(-C_1 \sin\frac{t}{2} + C_2 \cos\frac{t}{2}\right)$

$y(0) = C_1$ $y'(0) = -\frac{5}{2}C_1 + \frac{1}{2}C_2$ $C_1 = -4, C_2 = -10$

4a/ $2 + 4t - 2(-1-3t) + 4(3-t) = -8$ $6t = -24$ $t = -4$

$(-14, 11, 7)$

4b/ $3x + 7y - 3z = -10$ t.ex. $(0, -1, 1)$

4c/ $\begin{cases} 55k + 15m = 16 \\ 15k + 5m = 7 \end{cases}$

$k = -0.5$ $m = 2.9$

4d/
$k \cdot 1 + 1 = 2.5$
$k \cdot 2 + 1 = 1.7$
$k \cdot 3 + 1 = 1.5$
$k \cdot 4 + 1 = 0.9$
$k \cdot 5 + 1 = 0.4$

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A=[1 1; 2 1;
3 1; 4 1; 5 1]
y=[2.5; 1.7; 1.5;
   0.9; 0.4]
A\y
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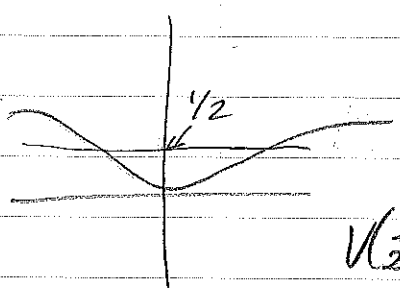
5a/ $-\left[\frac{1}{4}\ln|\cos 2x|\right]_0^{\pi/8} = +\frac{1}{8}\ln 2$

5b/ $t = x^2 - 1$ $\int \frac{x^4 \cdot 2x\,dx}{2(x^2-1)^4} = \frac{1}{2}\int \frac{(t+1)^2}{t^4}\,dt$

$= \left[-\frac{1}{t} - \frac{1}{t^2} - \frac{1}{3t^3}\right]_3^{\infty} = \frac{1}{3} + \frac{1}{9} + \frac{1}{81}$

6/



$V(h) = \int_0^h \pi x^2\,dy$

$V\left(\frac{1}{2}\right) = \pi\left[-\ln|1-y| - y\right]_0^{1/2} = \pi\left(\ln 2 - \frac{1}{2}\right)$
$= 0.61\,m^3$

$\frac{dV}{dt} = \frac{dV}{dh}\frac{dh}{dt}$ $\frac{dh}{dt} = \frac{1}{\pi x^2} = \frac{1}{0.25\pi}$

$= 1.27\ dm/s$

7/ $\int_0^x y(t)\,dt = 2\left(x - \frac{y(x)}{y'(x)}\right)$

$y = 3 - 2\ln(x+1)$