

1a $f'(3) \approx 4$ $g(-2.2) \approx g(-2) - 0.2 g'(-2) = -3 - 0.2 \cdot (-4) = -2.2$

1b $f'(x) = 4x(x^2 - 2)$ $y = 1 + 4(x+1)$ $y = 0 \Rightarrow x = -5/4$

1c $x = (3 \pm \sqrt{9 - 4 \cdot 2 \cdot (-2)}) / (-4) = (3 \pm 5) / (-4)$ $\xrightarrow{-2 \quad 1/2} \quad x < -2$
 $\xrightarrow{-2 \quad 1/2} \quad \text{resp } x > 1/2$

1d $f(-1.6) \approx 2.4 + \frac{3.2 - 2.4}{-1 - (-2)} (-1.6 - (-2)) = 2.4 + 0.8 \cdot 0.4 = 2.72$

2a $\int_{-1}^3 f(x) dx = \frac{3.2 + 2.1}{2} + \frac{2.1 + 0.5}{2} + \frac{0.5 - 0.2}{2} + \frac{-0.2 - 1.6}{2} = 3.2$

2b $x = 1 \Rightarrow y < 0$ $x = 2 \Rightarrow y > 0$ $x_0 = 1$ $x_1 = x_0 - (x_0^3 + 6x_0 - 10) / (3x_0^2 + 6) = 1.333$ $f(x_1) = 0.37$
 $x_2 = x_1 - \dots = 1.30$ $f(x_2) = 0.004$

2c $f'(x) = -2 + x + x^2$ $f(x) = -2x + \frac{x^2}{2} + \frac{x^3}{3} + C$ $C = 5 - \frac{5}{6}$ $\xrightarrow{-2 \quad 1} \text{max: } x = -2$
 $\xrightarrow{-2 \quad 1} \text{min: } x = 1$

2d $x^2 - 5x$ $\int_{-5}^0 -5x - x^2 = -\left[\frac{5x^2}{2} + \frac{x^3}{3}\right]_{-5}^0 = \frac{125}{6}$

3a $y' = -\frac{1}{3}y$ $y = Ce^{-\frac{1}{3}t}$ $y(0) - y'(0) = \frac{2}{3}Ce^{-\frac{1}{3} \cdot 0} = \frac{2}{3}C = 4$ $C = 6$

3b $y'' + 4y' + 5y = (9A + 12A + 5A)e^{3x} + (9B - 12B + 5B)e^{-3x}$ $A = \frac{6}{26}$ $B = \frac{7}{2}$

3c $r^2 + 4r + 5 = 0$ $r = -2 \pm \sqrt{4 - 5}$ $y = e^{-2t}(C_1 \cos t + C_2 \sin t)$ $y(0) = \underline{C_1} = 1$
 $y'(0) = -2e^{-2t}(C_1 \cos t + C_2 \sin t) + e^{-2t}(-C_1 \sin t + C_2 \cos t)$ $y'(0) = -2C_1 + C_2 = 1$
 $C_2 = 3$

4a $-1 + 4t - 2(2t) + 3(1+t) = 4 \Leftrightarrow 3t = +2$ $(\frac{5}{3}, \frac{4}{3}, \frac{5}{3})$

4b $m = \vec{AB} \times \vec{F} = (2, -2, -2) \times (4, -1, 2) = (-6, -12, 6)$ $\underline{x + 2y - z = 0 + 4 + 1 = 5}$

4c $\sum x^2 = 55$ $\sum x = 15$ $\sum xy = 28$ $\sum y = 12$ $\begin{cases} 55k + 15m = 28 \\ 15k + 5m = 12 \end{cases} \Rightarrow$
 $10k = -8$ $k = -0.8$ $m = (12 - 15k) / 5 = 4.8$ $\underline{y = -0.8x + 4.8}$

4d $\begin{cases} k \cdot 1 + m = 4 \\ k \cdot 2 + m = 3 \\ k \cdot 3 + m = 2.5 \\ k \cdot 4 + m = 2 \\ k \cdot 5 + m = 0.5 \end{cases} \Rightarrow A = [1 \ 1; 2 \ 1; 3 \ 1; 4 \ 1; 5 \ 1]$
 $\Rightarrow b = [4; 3; 2.5; 2; 0.5]$
 $\Rightarrow A \setminus b$

5a $\frac{\cos^2 x}{\cos 2x} = \frac{1}{2} \frac{1 + \cos 2x}{\cos 2x}$ 5b $\frac{x^5 + x^2}{x^6 + 1} = \frac{x^5 + x^2}{(x^3)^2 + 1}$

6 $A = \frac{1}{2} r^2 \theta = \frac{1}{2} \theta$ $\theta = \arctan 2h - \arctan k$ $\frac{d\theta}{dk} = \dots$

7a) f' växande 7b) $x = \frac{e^y - e^{-y}}{e^y + e^{-y}}$ $\frac{1}{1} = \frac{d}{dx}(\dots)$
 $y' = (f^{-1})'(x) = (1 - x^2)^{-1}$