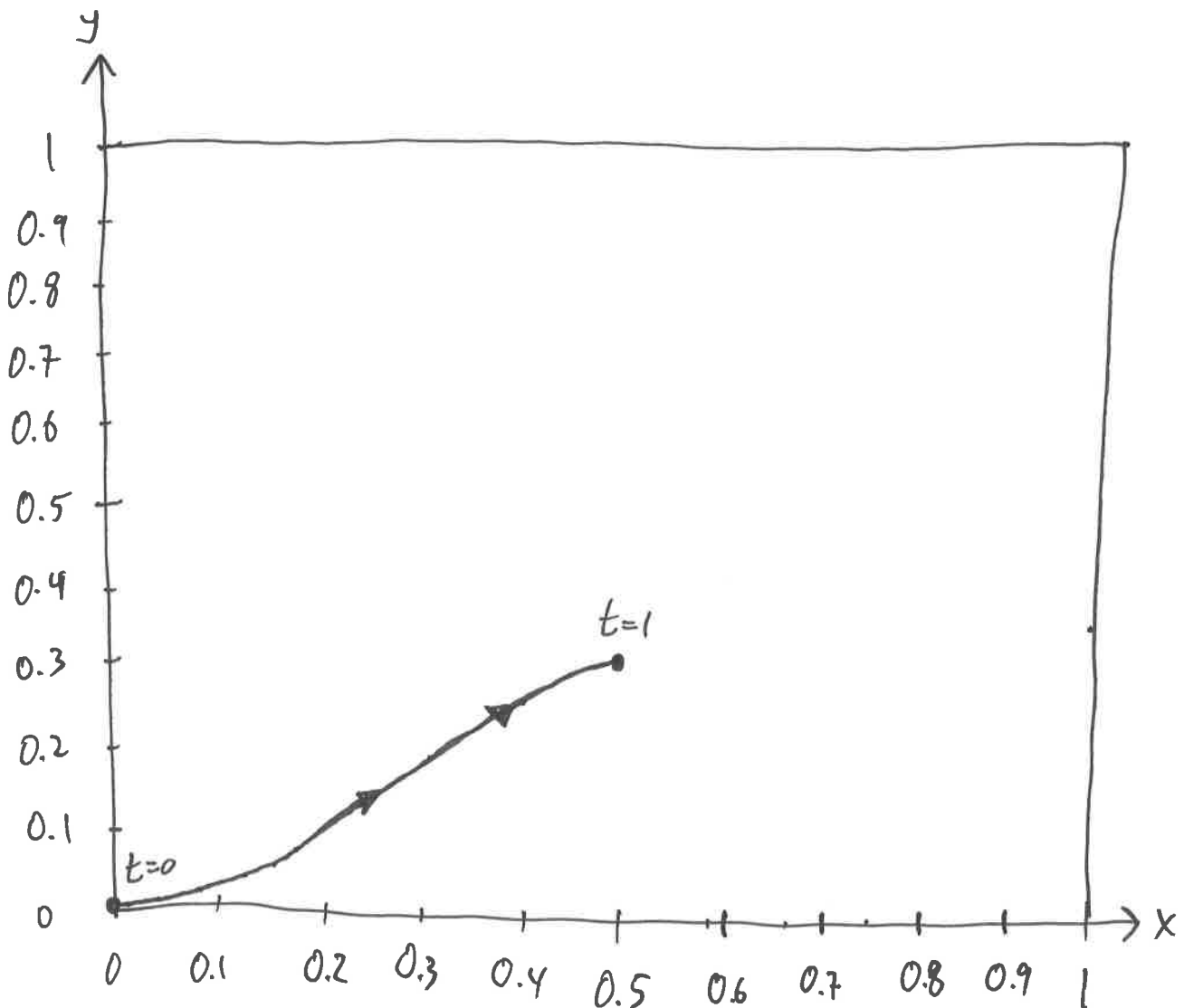


3) a) i)

t	x	y
0	0	0
0.1	0.005	0.0003
0.2	0.02	0.0026
0.3	0.045	0.009
0.4	0.08	0.0213
0.5	0.125	0.0416
0.6	0.18	0.072
0.7	0.245	0.1143
0.8	0.32	0.17
0.9	0.405	0.24
1	0.5	0.3



$$(3) \text{ a) ii) } x = \frac{1}{2}t^2, \quad y = \frac{1}{3}t^3, \quad (0 \leq t \leq 1)$$

$$(x')^2 = t^2$$

$$(y')^2 = t^4$$

$$(x')^2 + (y')^2 = t^2 + t^4 = t^2(1+t^2)$$

$$\int_0^1 \sqrt{(x')^2 + (y')^2} dt = \int_0^1 \sqrt{t^2(1+t^2)} dt$$

$$= \int_0^1 t \sqrt{1+t^2} dt$$

$$= \int_{u(0)}^{u(1)} \frac{du}{2dt} \sqrt{u} dt$$

$$\left[\begin{array}{l} u = 1+t^2 \\ du = 2t dt \\ t = \frac{du}{2dt} \end{array} \right]$$

$$= \frac{1}{2} \int_1^2 u^{1/2} du = \frac{1}{2} \left[\frac{1}{\frac{1}{2}+1} u^{\frac{1}{2}+1} \right]_1^2$$

$$= \frac{1}{2} \left[\frac{1}{3/2} u^{3/2} \right]_1^2 = \frac{1}{2} \cdot \frac{2}{3} \left(2^{3/2} - 1^{3/2} \right)$$

$$= \frac{1}{3} (\sqrt{8} - 1) = \frac{1}{3} (2\sqrt{2} - 1)$$

$$b) i) \quad x = 3t^2 - 5t, \quad x' = 0 \Rightarrow 6t - 5 = 0 \Rightarrow t = \frac{5}{6}$$

$$y = 5t^2 + t, \quad y' = 0 \Rightarrow 10t + 1 = 0 \Rightarrow t = -\frac{1}{10}$$

$$x\left(\frac{5}{6}\right) = -\frac{25}{12}, \quad y\left(\frac{5}{6}\right) = \frac{155}{36}$$

$$x\left(-\frac{1}{10}\right) = \frac{53}{100}, \quad y\left(-\frac{1}{10}\right) = -\frac{1}{20}$$



Vertikal tangent i $\left(-\frac{25}{12}, \frac{155}{36}\right)$

Horisontal tangent i $\left(\frac{53}{100}, -\frac{1}{20}\right)$

(ii) Normal:

$$\begin{cases} x = f(0) + g'(0) \cdot (t-0) \\ y = g(0) - f'(0) \cdot (t-0) \end{cases} \quad (-\infty < t < \infty)$$

$$\left[\begin{array}{l} f(0) = 3 \cdot 0^2 - 5 \cdot 0 = 0 \\ g(0) = 5 \cdot 0^2 + 0 = 0 \\ f'(t) = 6t - 5 \\ f'(0) = -5 \\ g'(t) = 10t + 1 \\ g'(0) = 1 \end{array} \right]$$

$$\text{Normal: } \begin{cases} x = 0 + 1 \cdot t \\ y = 0 - (-5) \cdot t \end{cases}$$

$$= \begin{cases} x = t \\ y = 5t \end{cases}$$

c) i)

$$r = \frac{5}{1 - \cos\theta}$$

$$r - r \cos\theta = 5$$

$$r - x = 5$$

$$r = 5 + x$$

$$r^2 = (5 + x)^2$$

$$x^2 + y^2 = x^2 + 10x + 25$$

$$y^2 = 10x + 25 \Rightarrow x = \frac{1}{10}y^2 - \frac{25}{10} = \frac{1}{10}y^2 - \frac{5}{2}$$

parabel

(ii) Achse: $y_0 = -\frac{0}{2 \cdot \frac{1}{10}} = 0$

Topppunkt: $(x_0 = -\frac{25}{10}, 0)$

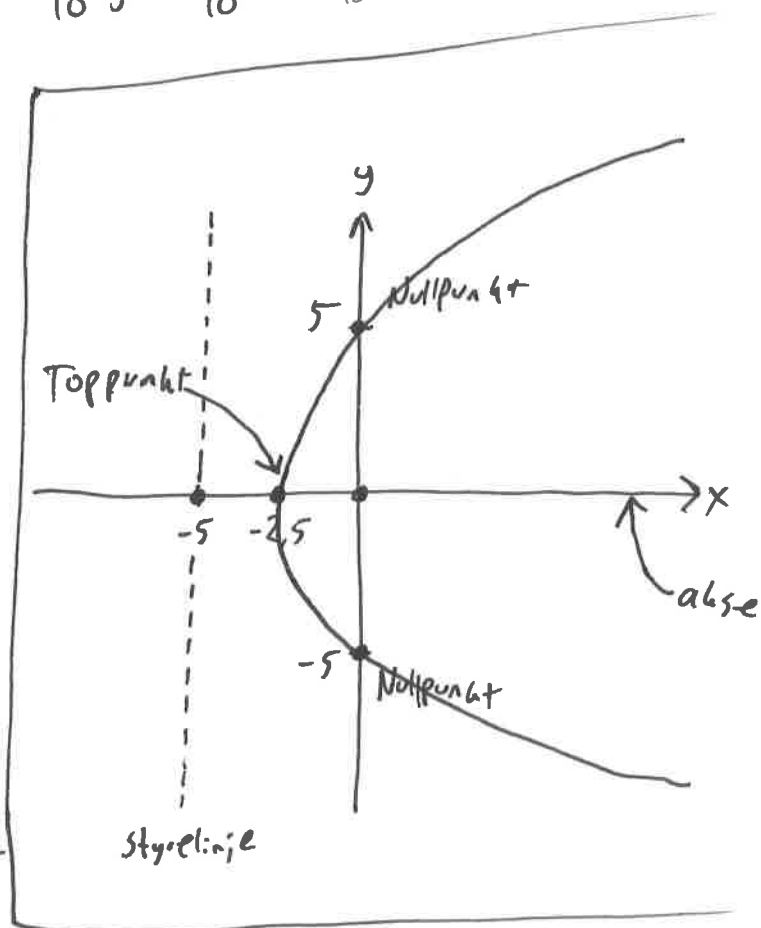
Brennpunkt: $(-\frac{25}{10} + \frac{1}{4 \cdot \frac{1}{10}}, 0)$
 $= (0, 0)$

Styrelinje: $x = -\frac{25}{10} - \frac{1}{4 \cdot \frac{1}{10}} = -5$

Nullpunkter: $y = 0 \pm \sqrt{0 - \frac{-25/10}{1/10}} = \pm 5$

Skjæring med x-aksen: $x = -\frac{25}{10}$

$$-\frac{25}{10} = -2.5$$



$$d) i) \vec{r}_0 = 5\vec{i} + \vec{j} - 2\vec{k}$$

$$\vec{n} = -2\vec{i} + 7\vec{j} - 4\vec{k}$$

$$-2(x-5) + 7(y-1) + (-4)(z+2) = 0$$

$$-2x + 10 + 7y - 7 - 4z - 8 = 0$$

$$\boxed{-2x + 7y - 4z = 5}$$

$$ii) Q = (1, 2, 3) \quad R = (3, 2, 1) \quad S = (1, 1, 1)$$

$$\vec{QR} = 2\vec{i} + 0\vec{j} - 2\vec{k}$$

$$\vec{QS} = 0\vec{i} - 1\vec{j} - 2\vec{k}$$

$$\vec{n} = \vec{QR} \times \vec{QS} = \begin{bmatrix} 0 & -2 & 2 & 0 \\ -1 & -2 & 0 & -1 \end{bmatrix}$$

$$\vec{n} = -2\vec{i} + 4\vec{j} - 2\vec{k}$$

$$\vec{r}_0 = \vec{i} + \vec{j} + \vec{k} \quad (\text{from } S)$$

$$-2(x-1) + 4(y-1) - 2(z-1) = 0$$

$$-2x + 2 + 4y - 4 - 2z + 2 = 0$$

$$-2x + 4y - 2z = 0$$

$$\boxed{2x - 4y + 2z = 0}$$

$$\boxed{x - 2y + z = 0}$$