a) $f(x) = \frac{1}{2}x^2 - 3x$ 1 · 2

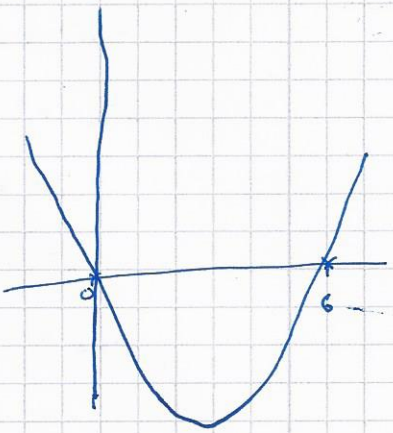
$= x^2 - 6x$

$x_{1,2} = -\frac{-6}{2} \pm \sqrt{(\frac{-6}{2})^2 - 0}$

$= 3 \pm 3$

$x_1 = 3 + 3 = 6$

$x_2 = 3 - 3 = 0$



$\int_0^6 \frac{1}{2}x^2 - 3x \, dx = \left[\frac{1}{6}x^3 - 1{,}5x^2\right]_0^6$

$A_0 = (\frac{1}{6} \cdot 6^3 - 1{,}5 \cdot 6^2) - (\frac{1}{6} \cdot 0^3 - 1{,}5 \cdot 0^2)$

$= -18$

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

$\frac{1}{2}x^4 + x^3 = 0$

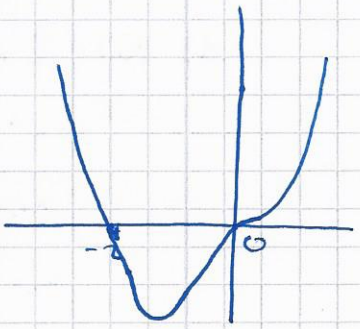
$x^3(\frac{1}{2}x + 1) = 0 \quad \Rightarrow x_1 = 0$

$\frac{1}{2}x + 1 = 0 \quad | -1$

$\frac{1}{2}x = -1 \quad | \cdot 2$

$x = -2$

Nullstellen: $\{-2; 0\}$



$\int_{-2}^{0} f(x) = \frac{1}{2}x^4 + x^3 \, dx = \left[\frac{1}{10}x^5 + \frac{1}{4}x^4\right]_{-2}^{0}$

$A_0 = (\frac{1}{10} \cdot (-2)^5 + \frac{1}{4} \cdot (-2)^4) - 0$

$= 0{,}8$

c) $f(x) = -x^4 + 6x^3 - 9x^2$

$-x^4 + 6x^3 - 9x^2 = 0$

$x^2(-x^2 + 6x) = 0 \quad \Rightarrow x_1 = 0$

$-x^2 + 6x = 0 \qquad | \cdot (-1)$

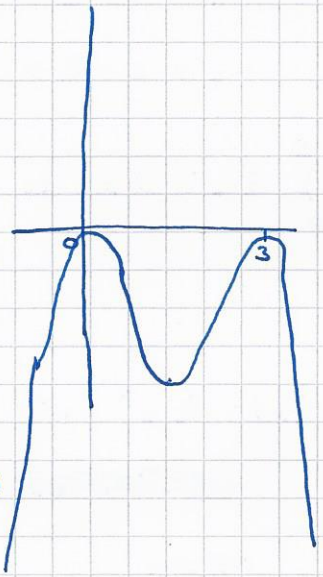
$x^2 - 6x = 0$

$x_{2,3} = -\frac{-6}{2} \pm \sqrt{(\frac{-6}{2})^2 - 0}$

$= 3 \pm 3$

$x_2 = 3 + 3 = 6$

$x_3 = 3 - 3 = 0$



$\int_0^3 -x^4 + 6x^3 - 9x^2 \, dx = \left[-\frac{1}{5}x^5 + \frac{6}{4}x^4 - 3x^3\right]_0^3$

$A_0 = (-\frac{1}{5} \cdot 3^5 + \frac{6}{4} \cdot 3^4 - 3 \cdot 3^3) - (0)$

$= -8,1$

d) $f(x) = \frac{1}{2}x^2 - \frac{1}{2}x - 3 \qquad | \cdot 2$

$= x^2 - x - 6$

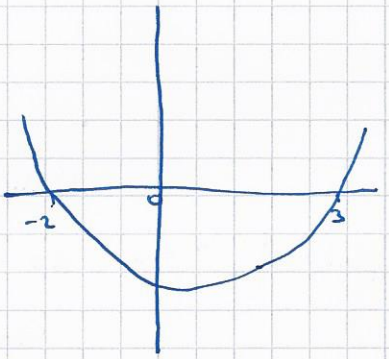
$x_{1,2} = -\frac{-1}{2} \pm \sqrt{(\frac{-1}{2})^2 + 6}$

$x_{1,2} = \frac{1}{2} \pm \sqrt{\frac{1}{4} + \frac{24}{4}}$

$x_{1,2} = \frac{1}{2} \pm \sqrt{\frac{25}{4}}$

$x_1 = \frac{1}{2} + \frac{5}{2} = \frac{6}{2} = 3$

$x_2 = \frac{1}{2} - \frac{5}{2} = -\frac{4}{2} = -2$



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

$A_0 = (\frac{1}{6} \cdot 3^3 - \frac{1}{4} \cdot 3^2 - 3 \cdot 3) - (\frac{1}{6} \cdot (-2)^3 - \frac{1}{4} \cdot (-2)^2 - 3 \cdot (-2))$

$= -10,42$