

Mathe Hausaufgaben 23032020

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a) $f(x) = \frac{1}{2}x^2 - 3x \quad | : x \rightarrow x_1 = 0$

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

$$f = 0$$

$$0 = \frac{1}{2}x^2 - 3x \quad | +3$$

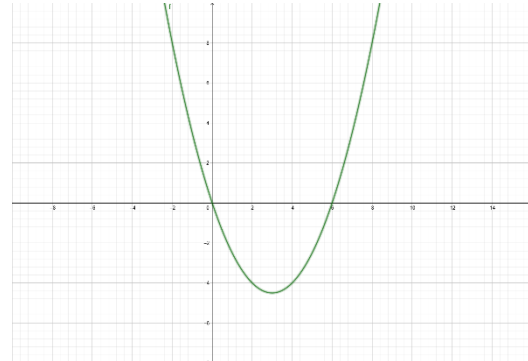
$$3 = \frac{1}{2}x^2 \quad | : \frac{1}{2}$$

$$6 = x$$

$$x_1 = 0; x_2 = 6$$

$$F(x) = \frac{0,5}{3} x^3 - \frac{3}{2} x^2 + c$$

$$\begin{aligned} \int_0^6 \left[\frac{1}{2}x^2 - 3x \right] dx &= \left[\frac{0,5}{3} x^3 - \frac{3}{2} x^2 + c \right]_0^6 \\ &= F(6) - F(0) \\ &= \left(\frac{0,5}{3} * 6^3 - \frac{3}{2} * 6^2 + c \right) - \left(\frac{0,5}{3} * 0^3 - \frac{3}{2} * 0^2 + c \right) \\ &= (36 - 54 + c) - (0 - 0 + c) \\ &= (-18 + c) - (0 + c) \\ &= -18 + \cancel{c} - 0 + \cancel{c} \\ &= -18 \text{ FE} \end{aligned}$$



b) $f(x) = \frac{1}{2}x^4 + x^3 \quad | : x^3 \rightarrow x_{1,2,3} = 0$

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

$$f = 0$$

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

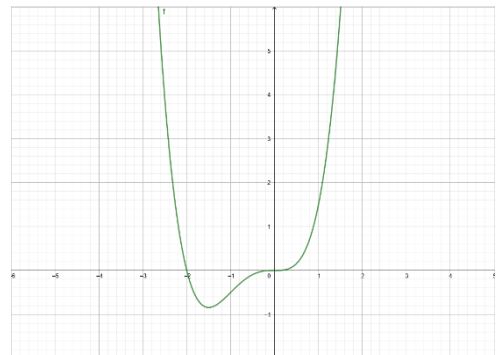
$$-1 = \frac{1}{2}x^4 \quad | : \frac{1}{2}$$

$$-2 = x$$

$$x_{1,2,3} = 0; x_4 = -2$$

$$F(x) = \frac{0,5}{5} x^5 + \frac{1}{4} x^4 + c$$

$$\begin{aligned} \int_0^{-2} \left[\frac{1}{2}x^4 - x^3 \right] dx &= \left[\frac{0,5}{5} x^5 + \frac{1}{4} x^4 + c \right]_0^{-2} \\ &= F(-2) - F(0) \\ &= \left(\frac{0,5}{5} * (-2)^5 + \frac{1}{4} * (-2)^4 + c \right) - \left(\frac{0,5}{5} * 0^5 + \frac{1}{4} * 0^4 + c \right) \\ &= (-3,2 + 4 + c) - (0 - 0 + c) \\ &= (0,8 + c) - (0 + c) \\ &= 0,8 + \cancel{c} - 0 + \cancel{c} \\ &= 0,8 \text{ FE} \end{aligned}$$



$$\begin{aligned} \text{c) } f(x) &= -x^4 + 6x^3 - 9x^2 \quad | : x^2 \rightarrow x_{1,2} = 0 \\ f(x) &= -x^2 + 6x - 9 \quad | : (-1) \\ f(x) &= x^2 - 6x + 9 \\ f &= ! 0 \end{aligned}$$

$$- \frac{-6}{2} \pm \sqrt{\left(\frac{-6}{2}\right)^2 - 9}$$

$$3 \pm \sqrt{9 - 9}$$

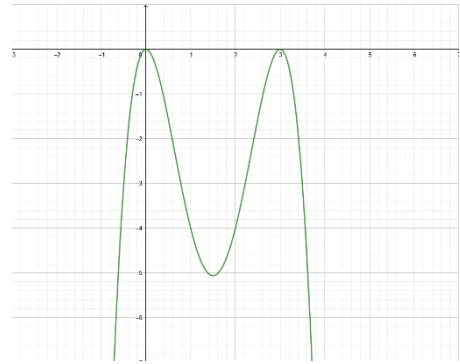
$$x_3 = 3 + 0 = 3$$

$$x_4 = 3 - 0 = 3$$

$$x_{1,2} = 0 ; x_{3,4} = 3$$

$$F(x) = -\frac{1}{5}x^5 + \frac{6}{4}x^4 - 3x^3$$

$$\begin{aligned} \int_0^3 [-x^4 + 6x^3 - 9x^2] dx &= \left[-\frac{1}{5}x^5 + \frac{6}{4}x^4 - 3x^3\right]_0^3 \\ &= F(3) - F(0) \\ &= \left(-\frac{1}{5} * 3^5 + \frac{6}{4} * 3^4 - 3 * 3^3 + c\right) - \left(-\frac{1}{5} * 0^5 + \frac{6}{4} * 0^4 - 3 * 0^3 + c\right) \\ &= (-48,6 + 121,5 - 81 + c) - (0 + 0 - 0 + c) \\ &= (-8,1 + c) - (0 + c) \\ &= -8,1 + c - 0 + c \\ &= -8,1 \text{ FE} \end{aligned}$$



$$\begin{aligned} \text{d) } f(x) &= \frac{1}{2}x^2 - \frac{1}{2}x - 3 \quad | : \frac{1}{2} \\ f(x) &= x^2 - x - 6 \\ f &= ! 0 \end{aligned}$$

$$- \frac{-1}{2} \pm \sqrt{\left(\frac{-1}{2}\right)^2 + 6}$$

$$0,5 \pm \sqrt{0,25 + 6}$$

$$0,5 \pm \sqrt{6,25}$$

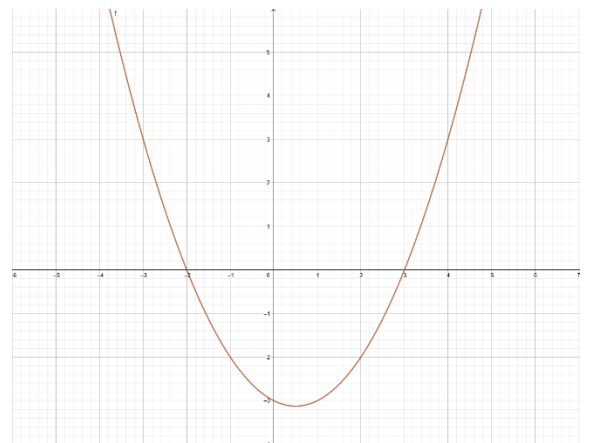
$$x_1 = 0,5 + 2,5 = 3$$

$$x_2 = 0,5 - 2,5 = -2$$

$$x_1 = 3 ; x_2 = -2$$

$$F(x) = \frac{0,5}{3}x^3 + \frac{0,5}{2}x^2 - 3x$$

$$\begin{aligned} \int_{-2}^3 \left[\frac{1}{2}x^2 - \frac{1}{2}x - 3\right] dx &= \left[\frac{0,5}{3}x^3 + \frac{0,5}{2}x^2 - 3x\right]_{-2}^3 \\ &= F(3) - F(-2) \end{aligned}$$



$$\begin{aligned} &= \left(\frac{0,5}{3} * 3^3 + \frac{0,5}{2} * 3^2 - 3 * 3 + c \right) - \left(\frac{0,5}{3} * (-2)^3 + \frac{0,5}{2} * (-2)^2 - 3 * (-2) + c \right) \\ &= (4,5 + 2,25 - 9 + c) - \left(-\frac{4}{3} + 1 + 6 + c \right) \\ &= (-2,25 + c) - \left(\frac{17}{3} + c \right) \\ &= -\frac{9}{4} - \frac{17}{3} \\ &= -\frac{95}{12} FE \end{aligned}$$