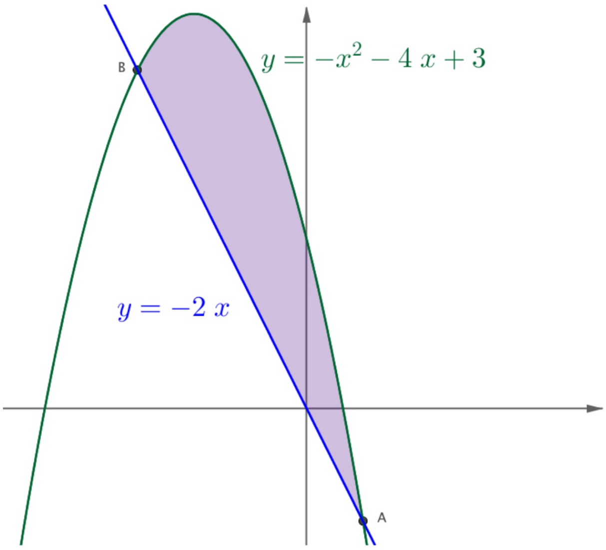
Find the area between the curves.

1.



$$\overbrace{(-x^2 - 4x + 3)}^{top} - \overbrace{(-2x)}^{bottom}$$

$$= -x^2 - 2x + 3$$

$$\overbrace{(-x^2 - 4x + 3)}^{top} = \overbrace{(-2x)}^{bottom}$$

$$-x^2 - 2x + 3 = 0$$

$$x^2 + 2x - 3 = 0$$

$$(x-1)(x+3) = 0$$

$$x = -3 \quad or \quad x = 1$$

$$\int_{-3}^{1} (-x^2 - 2x + 3)\,dx$$

$$\int_{-3}^{1} (-x^2 - 2x + 3)\,dx$$

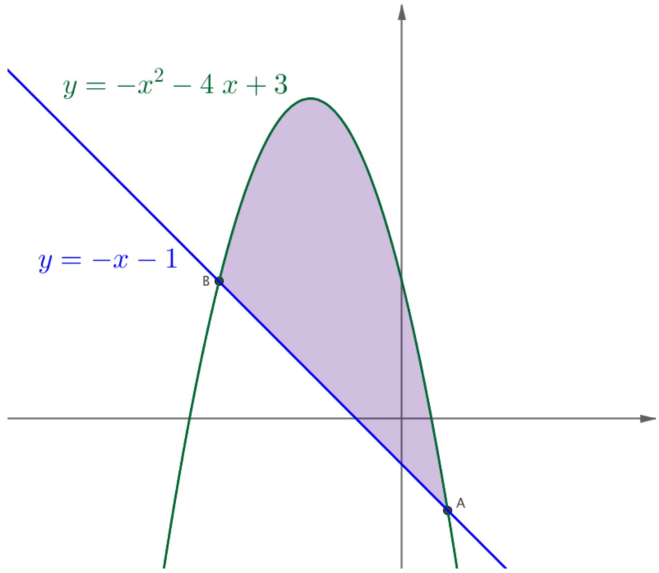
$$= \left[\frac{-1}{3}x^3 - 1x^2 + 3x\right]_{-3}^{1}$$

$$= \left(\frac{-1}{3} \times (1)^3 - 1 \times (1)^2 + 3 \times (1)\right) - \left(\frac{-1}{3} \times (-3)^3 - 1 \times (-3)^2 + 3 \times (-3)\right)$$

$$= \left(\frac{5}{3}\right) - \left(-9\right)$$

$$= \frac{32}{3} \qquad Area = \frac{32}{3}\ units^2$$

2.



$$\overbrace{(-x^2 - 4\,x + 3)}^{top} \quad - \quad \overbrace{(-x - 1)}^{bottom}$$

$$= -x^2 - 3x + 4$$

$$\overbrace{(-x^2 - 4\,x + 3)}^{top} \quad = \quad \overbrace{(-x - 1)}^{bottom}$$

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

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

$$(x-1)(x+4) = 0$$

$$x = -4 \quad or \quad x = 1$$

$$\int_{-4}^{1} (-x^2 - 3\,x + 4)\,dx$$

$$\int_{-4}^{1} (-x^2 - 3\,x + 4)\,dx$$

$$= \left[\frac{-1}{3}x^3 - \frac{3}{2}x^2 + 4x\ \right]_{-4}^{1}$$

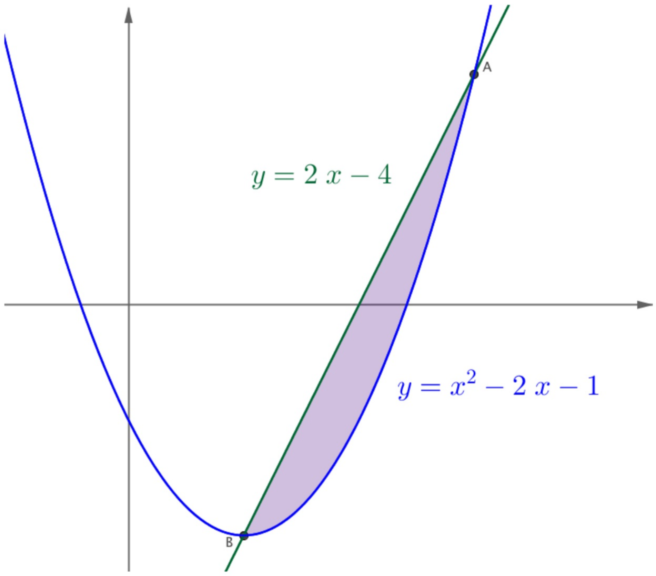
$$= \left(\frac{-1}{3} \times (1)^3 - \frac{3}{2} \times (1)^2 + 4 \times (1)\right) - \left(\frac{-1}{3} \times (-4)^3 - \frac{3}{2} \times (-4)^2 + 4 \times (-4)\right)$$

$$= \left(\frac{13}{6}\right) \quad - \quad \left(\frac{-56}{3}\right)$$

$$= \frac{125}{6}$$

$$Area = \frac{125}{6}\ \ units^2$$

3.



$$\overbrace{(2x-4)}^{top} - \overbrace{(x^2-2x-1)}^{bottom}$$

$$= -x^2 + 4x - 3$$

$$\overbrace{(2x-4)}^{top} = \overbrace{(x^2-2x-1)}^{bottom}$$

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

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

$$(x-3)(x-1) = 0$$

$$x = 1 \quad or \quad x = 3$$

$$\int_1^3 (-x^2 + 4x - 3)\, dx$$

$$\int_1^3 (-x^2 + 4x - 3)\, dx$$

$$= \left[\frac{-1}{3}x^3 + 2x^2 - 3x\right]_1^3$$

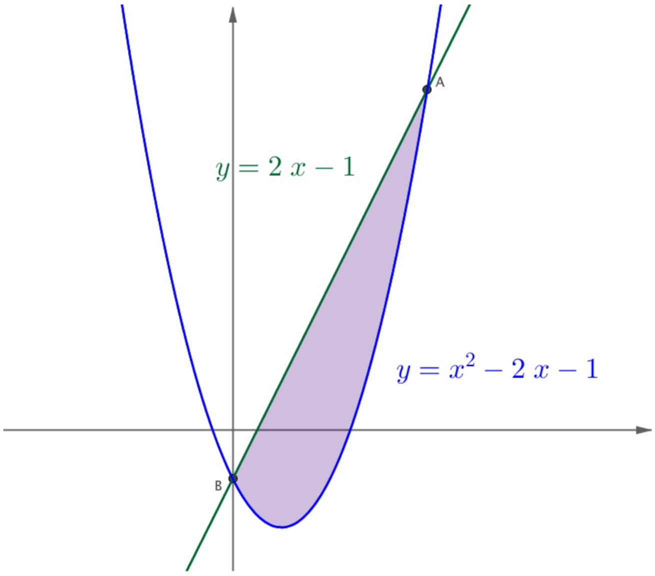
$$= \left(\frac{-1}{3} \times (3)^3 + 2 \times (3)^2 - 3 \times (3)\right) - \left(\frac{-1}{3} \times (1)^3 + 2 \times (1)^2 - 3 \times (1)\right)$$

$$= (0) - \left(\frac{-4}{3}\right)$$

$$= \frac{4}{3}$$

$$Area = \frac{4}{3}\ units^2$$

4.



$$\overbrace{(2x - 1)}^{top} - \overbrace{(x^2 - 2x - 1)}^{bottom}$$

$$= -x^2 + 4x$$

$$\overbrace{(2x - 1)}^{top} = \overbrace{(x^2 - 2x - 1)}^{bottom}$$

$$-x^2 + 4x = 0$$

$$x^2 - 4x = 0$$

$$x(x - 4) = 0$$

$$x = 0 \quad or \quad x = 4$$

$$\int_0^4 (-x^2 + 4x)\, dx$$

$$\int_0^4 (-x^2 + 4x)\, dx$$

$$= \left[\frac{-1}{3}x^3 + 2x^2\right]_0^4$$

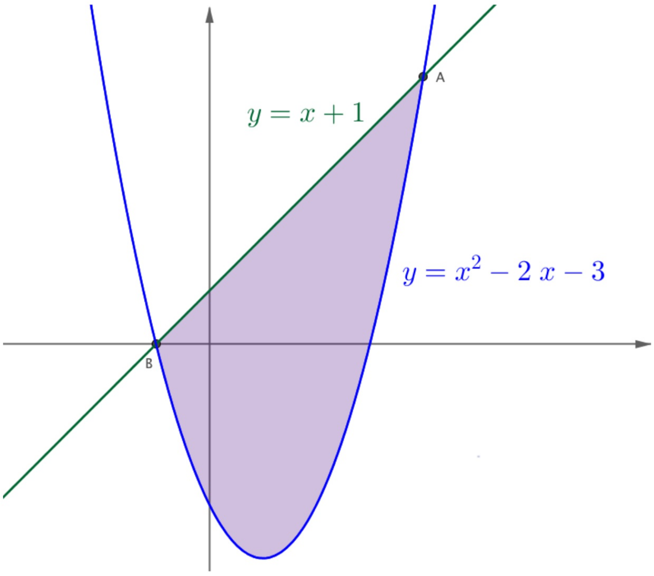
$$= \left(\frac{-1}{3} \times (4)^3 + 2 \times (4)^2\right) - \left(\frac{-1}{3} \times (0)^3 + 2 \times (0)^2\right)$$

$$= \left(\frac{32}{3}\right) - \left(0\right)$$

$$= \frac{32}{3}$$

$$Area = \frac{32}{3}\ units^2$$

5.



$$\overbrace{(x+1)}^{top} \; - \; \overbrace{(x^2 - 2\,x - 3)}^{bottom}$$

$$= -x^2 + 3x + 4$$

$$\overbrace{(x+1)}^{top} \; = \; \overbrace{(x^2 - 2\,x - 3)}^{bottom}$$

$$-x^2 + 3x + 4 = 0$$
$$x^2 - 3x - 4 = 0$$
$$(x-4)(x+1) = 0$$
$$x = -1 \quad or \quad x = 4$$

$$\int_{-1}^{4} (-x^2 + 3\,x + 4)\,dx$$

$$\int_{-1}^{4} (-x^2 + 3\,x + 4)\,dx$$

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

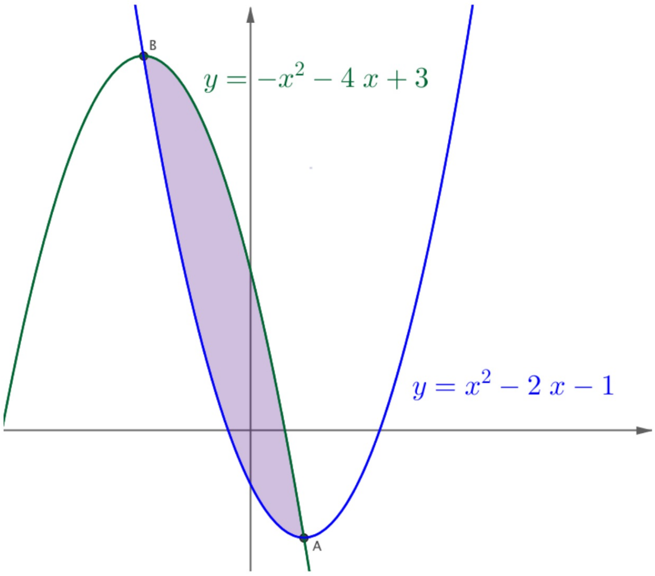
$$= \left(\frac{-1}{3} \times (4)^3 + \frac{3}{2} \times (4)^2 + 4 \times (4)\right) - \left(\frac{-1}{3} \times (-1)^3 + \frac{3}{2} \times (-1)^2 + 4 \times (-1)\right)$$

$$= \left(\frac{56}{3}\right) \; - \; \left(\frac{-13}{6}\right)$$

$$= \frac{125}{6}$$

$$Area = \frac{125}{6}\ units^2$$

6.



$$\overbrace{(\,-x^2 - 4\,x + 3\,)}^{top} \;-\; \overbrace{(x^2 - 2\,x - 1)}^{bottom}$$

$$= -2x^2 - 2x + 4$$

$$\overbrace{(\,-x^2 - 4\,x + 3\,)}^{top} \;=\; \overbrace{(x^2 - 2\,x - 1)}^{bottom}$$

$$-2x^2 - 2x + 4 = 0$$

$$x^2 + x - 2 = 0$$

$$(x-1)(x+2) = 0$$

$$x = -2 \quad or \quad x = 1$$

$$\int_{-2}^{1} (-2\,x^2 - 2\,x + 4)\,dx$$

$$\int_{-2}^{1} (-2\,x^2 - 2\,x + 4)\,dx$$

$$= \left[\frac{-2}{3}\,x^3 - 1x^2 + 4x\;\right]_{-2}^{1}$$

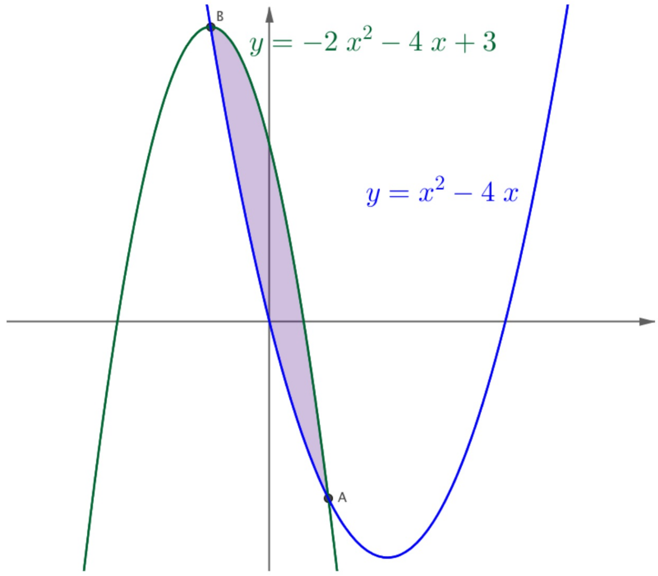
$$= \left(\frac{-2}{3} \times (1)^3 - 1 \times (1)^2 + 4 \times (1)\right) - \left(\frac{-2}{3} \times (-2)^3 - 1 \times (-2)^2 + 4 \times (-2)\right)$$

$$= \left(\frac{7}{3}\right) \;-\; \left(\frac{-20}{3}\right)$$

$$= 9$$

$$Area = 9\ units^2$$

7.



$$\overbrace{(-2\,x^2 - 4\,x + 3)}^{top} \;-\; \overbrace{(x^2 - 4\,x)}^{bottom}$$

$$= -3x^2 + 3$$

$$\overbrace{(-2\,x^2 - 4\,x + 3)}^{top} \;=\; \overbrace{(x^2 - 4\,x)}^{bottom}$$

$$-3x^2 + 3 = 0$$

$$x^2 - 1 = 0$$

$$(x-1)(x+1) = 0$$

$$x = -1 \quad or \quad x = 1$$

$$\int_{-1}^{1} (-3\,x^2 + 3)\,dx$$

$$\int_{-1}^{1} (-3\,x^2 + 3)\,dx$$

$$= \left[-1x^3 + 3x\ \right]_{-1}^{1}$$

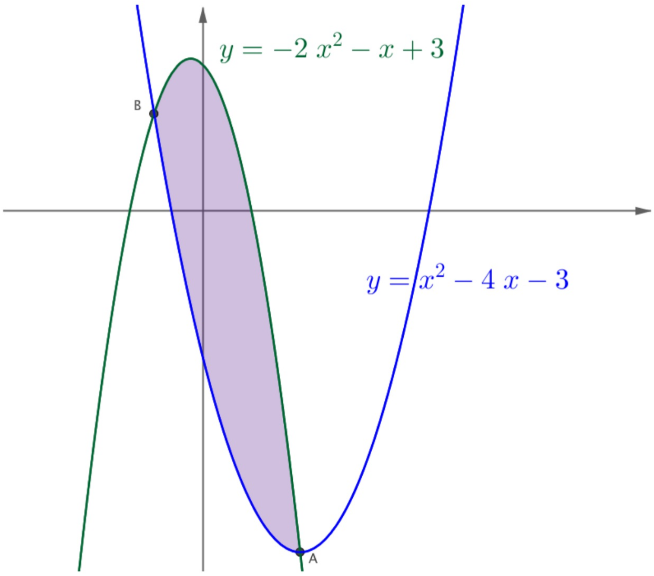
$$= \left(-1 \times (1)^3 + 3 \times (1)\right) - \left(-1 \times (-1)^3 + 3 \times (-1)\right)$$

$$= \left(2\right) \;-\; \left(-2\right)$$

$$= 4$$

$$Area = 4\ units^2$$

8.



$$\overbrace{(\,-2\,x^2-x+3\,)}^{top} \;-\; \overbrace{(x^2-4\,x-3)}^{bottom}$$

$$=-3x^2+3x+6$$

$$\overbrace{(\,-2\,x^2-x+3\,)}^{top} \;=\; \overbrace{(x^2-4\,x-3)}^{bottom}$$

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

$$x^2-x-2=0$$

$$(x-2)(x+1)=0$$

$$x=-1 \quad or \quad x=2$$

$$\int_{-1}^{2}(-3\,x^2+3\,x+6)\,dx$$

$$\int_{-1}^{2}(-3\,x^2+3\,x+6)\,dx$$

$$=\left[-1x^3+\frac{3}{2}x^2+6x\;\right]_{-1}^{2}$$

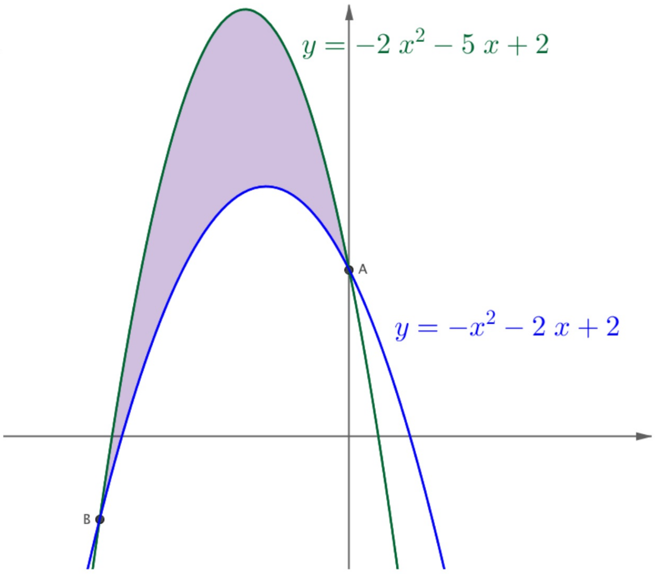
$$=\left(-1\times(2)^3+\frac{3}{2}\times(2)^2+6\times(2)\right)-\left(-1\times(-1)^3+\frac{3}{2}\times(-1)^2+6\times(-1)\right)$$

$$=\left(10\right)\;-\;\left(\frac{-7}{2}\right)$$

$$=\frac{27}{2}$$

$$Area=\frac{27}{2}\;\;units^2$$

9.



$$\overbrace{(-2\,x^2 - 5\,x + 2)}^{top} \quad - \quad \overbrace{(-x^2 - 2\,x + 2)}^{bottom}$$

$$= -x^2 - 3x$$

$$\overbrace{(-2\,x^2 - 5\,x + 2)}^{top} \quad = \quad \overbrace{(-x^2 - 2\,x + 2)}^{bottom}$$

$$-x^2 - 3x = 0$$

$$x^2 + 3x = 0$$

$$x(x + 3) = 0$$

$$x = -3 \quad or \quad x = 0$$

$$\int_{-3}^{0} (-x^2 - 3\,x)\,dx$$

$$\int_{-3}^{0} (-x^2 - 3\,x)\,dx$$

$$= \left[\frac{-1}{3}\,x^3 - \frac{3}{2}\,x^2\right]_{-3}^{0}$$

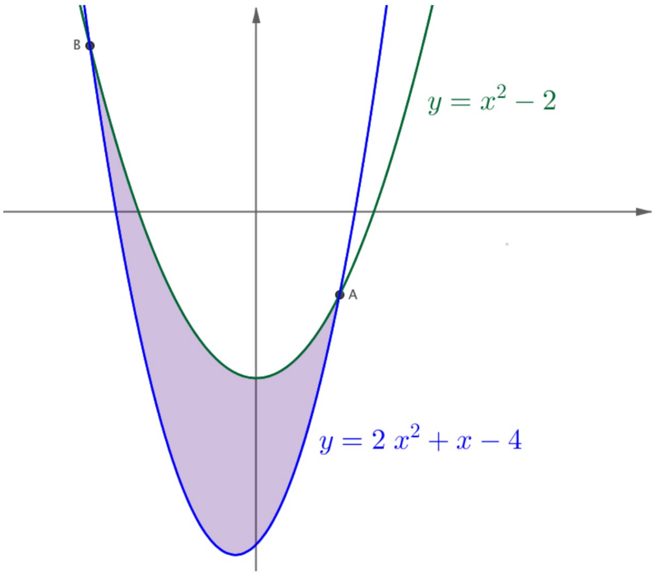
$$= \left(\frac{-1}{3} \times (0)^3 - \frac{3}{2} \times (0)^2\right) - \left(\frac{-1}{3} \times (-3)^3 - \frac{3}{2} \times (-3)^2\right)$$

$$= (0) \quad - \quad \left(\frac{-9}{2}\right)$$

$$= \frac{9}{2}$$

$$Area = \frac{9}{2}\ units^2$$

10.



$$\overbrace{(x^2 - 2)}^{top} - \overbrace{(2\,x^2 + x - 4)}^{bottom}$$

$$= -x^2 - x + 2$$

$$\overbrace{(x^2 - 2)}^{top} = \overbrace{(2\,x^2 + x - 4)}^{bottom}$$

$$-x^2 - x + 2 = 0$$

$$x^2 + x - 2 = 0$$

$$(x-1)(x+2) = 0$$

$$x = -2 \quad or \quad x = 1$$

$$\int_{-2}^{1} (-x^2 - x + 2)\, dx$$

$$\int_{-2}^{1} (-x^2 - x + 2)\, dx$$

$$= \left[\frac{-1}{3}x^3 - \frac{1}{2}x^2 + 2x\ \right]_{-2}^{1}$$

$$= \left(\frac{-1}{3} \times (1)^3 - \frac{1}{2} \times (1)^2 + 2 \times (1)\right) - \left(\frac{-1}{3} \times (-2)^3 - \frac{1}{2} \times (-2)^2 + 2 \times (-2)\right)$$

$$= \left(\frac{7}{6}\right) - \left(\frac{-10}{3}\right)$$

$$= \frac{9}{2}$$

$$Area = \frac{9}{2}\ units^2$$