

数Ⅱ(定積分と面積 ②)

⑥ 次の曲線や直線で囲まれた図形の面積 S を求めよう。

① $y = x^2 - 3x + 5$, $y = 2x - 1$

② $y = x^2 - 4$, x 軸

③ $y = x^2 - 6x + 7$, $y = -x^2 + 2x + 1$


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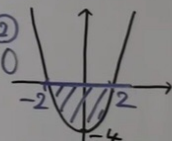
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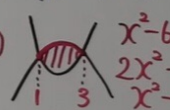
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① 
$$\begin{aligned} x^2 - 3x + 5 &= 2x - 1 \\ x^2 - 5x + 6 &= 0 \\ (x-3)(x-2) &= 0 \\ x &= 3, 2 \end{aligned}$$

$$\begin{aligned} S &= \int_2^3 (-x^2 + 5x - 6) dx \\ &= \left[-\frac{1}{3}x^3 + \frac{5}{2}x^2 - 6x \right]_2^3 \\ &= \left(-9 + \frac{45}{2} - 18 \right) - \left(-\frac{8}{3} + 10 - 12 \right) = \frac{1}{6} \end{aligned}$$

② 
$$\begin{aligned} 0 &= x^2 - 4 \rightarrow x^2 = 4 \rightarrow x = \pm 2 \\ S &= \int_{-2}^2 (-x^2 + 4) dx \\ &= \left[-\frac{1}{3}x^3 + 4x \right]_{-2}^2 \\ &= 0 - \left(-\frac{8}{3} + 8 \right) - \left(+\frac{8}{3} - 8 \right) \end{aligned}$$

③ 
$$\begin{aligned} x^2 - 6x + 7 &= -x^2 + 2x + 1 \\ 2x^2 - 8x + 6 &= 0 \\ x^2 - 4x + 3 &= 0 \rightarrow x = 1, 3 \end{aligned}$$

$$\begin{aligned} S &= \int_1^3 (-2x^2 + 8x - 6) dx \\ &= \left[-\frac{2}{3}x^3 + 4x^2 - 6x \right]_1^3 \\ &= \left(-18 + 36 - 18 \right) - \left(-\frac{2}{3} + 4 - 6 \right) = \frac{8}{3} \end{aligned}$$