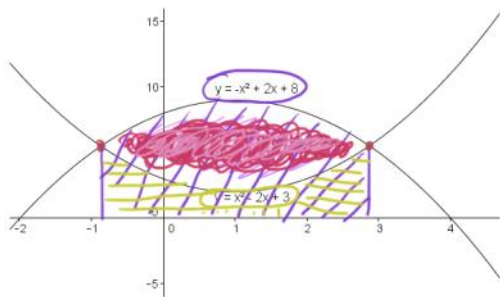


Integration lesson 7

Thursday, December 19, 2013

6:15 AM

Area bounded by 2 curves



- ① Find points of intersection
- ② Find area below top curve
- ③ Find area below bottom curve
- ④ Ans from ② - Ans from ③

① Finding the intersection

$$y = -x^2 + 2x + 8 \quad \text{--- ①}$$

$$y = x^2 - 2x + 3 \quad \text{--- ②}$$

sub y from eq ① into eq ②

$$-x^2 + 2x + 8 = x^2 - 2x + 3$$

$$0 = x^2 - 2x + 3 + x^2 - 2x - 8$$

$$0 = 2x^2 - 4x - 5$$

$$a = 2, b = -4, c = -5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-4) \pm \sqrt{(-4)^2 - 4 \times 2 \times -5}}{2 \times 2}$$

$$= 2.87 \text{ or } -0.87 \text{ (2dp)}$$

② Find area below top curve $y = -x^2 + 2x + 8$

$$\int_{-0.87}^{2.87} -x^2 + 2x + 8 \, dx$$

$$= \left[-\frac{x^3}{3} + \frac{2x^2}{2} + 8x \right]_{-0.87}^{2.87}$$

$$= \left[\frac{-(2.87)^3}{3} + 2.87^2 + 8 \times 2.87 \right] - \left[\frac{-(-0.87)^3}{3} + (-0.87)^2 + 8 \times (-0.87) \right]$$

$$= 23.31693 - -5.98$$

$$= 29.3 \text{ (2dp)}$$

③ Find area below bottom curve $y = x^2 - 2x + 3$

$$\int_{-0.87}^{2.87} x^2 - 2x + 3 \, dx$$

$$= \left[\frac{x^3}{3} - \frac{2x^2}{2} + 3x \right]_{-0.87}^{2.87}$$

$$= \left(\frac{2.87^3}{3} - 2.87^2 + 3 \times 2.87 \right) - \left(\frac{(-0.87)^3}{3} - (-0.87)^2 + 3(-0.87) \right)$$

$$= 8.253 - -3.5864$$

$$= 11.84 \text{ (2dp)}$$

④ Area bounded by the 2 curves = $29.3 - 11.84$
 $= 17.46 \text{ units}^2$