the thing

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1 Q16

$$y = px^2 + qx + 4$$

$$y = x$$

$$\frac{dy}{dx} = 2px + q$$

$$a = 2pb + q$$

$$b = 2pa + q$$

$$a - b = 2pb - 2pa$$

$$a - b = -2p(a - b)$$

$$\frac{a - b}{a - b} = -2p$$

$$1 = -2p$$

$$p = -1/2$$

$$y = -1/2x^2 + qx + 4$$

$$y = x \implies x = -1/2x^2 + qx + 4$$

$$0 = -1/2x^2 + (q - 1)x + 4$$

we know that the for each solution the gradient will be equal to the x coordinate of the other

$$\therefore$$

due to the quadratic formula and

$$\frac{dy}{dx} = -x + q$$

$$\frac{1 - q + \sqrt{q^2 - 2q - 7}}{-1} = -1(\frac{1 - q - \sqrt{q^2 - 2q - 7}}{-1}) + q$$

$$q - 1 - \sqrt{q^2 - 2q - 7} = -1(q - 1 + \sqrt{q^2 - 2q - 7}) + q$$

$$q - 1 - \sqrt{q^2 - 2q - 7} = -q + 1 - \sqrt{q^2 - 2q - 7}) + q$$

$$q - 1 = -q + 1 + q$$

$$q = 2$$

$$0 = -1/2x^2 + (2 - 1)x + 4$$

$$0 = -1/2x^2 + 1x + 4$$

$$x = -2$$

$$x = 4 \implies A = (-2, -2), B = (4, 4)$$