

Q6

Wednesday, October 20, 2021 3:01 PM

1. (2 points) Who was the author of the 'Discorsi'? What year was it published?

Galileo, 1638

2. (1 points) Who unified Algebra and Geometry? What year was the book describing this unification published?

Descartes. 1637

3. (2 point) What are the names of the two persons who discovered the differential calculus? Who was first to *discover* it? Who was the first to *publish* it?

Newton and Leibniz. Newton discovered, while Leibniz published.

4. (5 points) Use Cardano's method (no credit for other methods!) to find the three roots of the cubic equation

$$x^3 + 6x - 7 = 0$$

$$x^3 + 6x = 7$$

$$u^3 - v^3 = 7$$

$$3uv = 6$$

$$x = u - v$$

$$(u^3 - v^3)^2 = 49$$

$$uv = 2$$

$$u^3 + v^3 = 9$$

$$u^3 v^3 = 8$$

$$u^3 - v^3 = 7$$

$$4u^3 v^3 = 32$$

$$\begin{aligned} u^6 - 2u^3 v^3 + v^6 &= 49 \\ + 4u^3 v^3 &= 32 \end{aligned}$$

$$2u^3 = 16$$

$$u = 2$$

$$(u^3 + v^3)^2 = 9^2$$

$$2v^3 = 2$$

$$u^3 + v^3 = 9$$

$$v = 1$$

$$x = u - v = 1$$

$$x - u - v = 1$$

$$= \left(\frac{-1}{2} + i \frac{\sqrt{3}}{2} \right) 2 + \left(\frac{-1}{2} - i \frac{\sqrt{3}}{2} \right) 1$$

$$= \frac{-2}{2} + 2i \frac{\sqrt{3}}{2} - \frac{1}{2} - i \frac{\sqrt{3}}{2}$$

$$= \frac{-3}{2} + i \frac{\sqrt{3}}{2}$$

$$= \left(\frac{1}{2} - i \frac{\sqrt{3}}{2} \right) 2 + \left(\frac{-1}{2} + i \frac{\sqrt{3}}{2} \right) 1$$

$$= \frac{2}{2} - 2i \frac{\sqrt{3}}{2} - \frac{1}{2} + i \frac{\sqrt{3}}{2}$$

$$= \frac{-3}{2} - i \frac{\sqrt{3}}{2}$$