

AD 26

How do you know if a problem is optimization? What are the steps to solve?

Problem is optimization if it asks for a max/min, biggest/smallest, closest/furthest.

1. Assign symbols & make sketch.
2. Write primary eqn. (what u max/min).
3. Reduce primary so in terms of one variable.
4. Take derivative & set = 0. Solve for that variable.
5. Verify that you have max or min.

AD 27

Which points on the graph of $y = 4 - x^2$ are closest to the point (0,2)?

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Points

(0, 2)

 $(x, 4 - x^2)$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$d = \sqrt{(x - 0)^2 + (4 - x^2 - 2)^2}$$

$$d = \sqrt{x^2 + (-x^2 + 2)^2}$$

$$d = \sqrt{x^2 + x^4 - 4x^2 + 4}$$

$$d = \sqrt{x^4 - 3x^2 + 4}$$

$$\frac{d}{dx} [d = (x^4 - 3x^2 + 4)^{1/2}]$$

$$d' = \frac{1}{2} (x^4 - 3x^2 + 4)^{-1/2} (4x^3 - 6x)$$

$$0 = \frac{4x^3 - 6x}{2 \sqrt{x^4 - 3x^2 + 4}}$$

$$4x^3 - 6x = 0$$

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

$$x = 0 \quad x = \pm \sqrt{3/2}$$

$$-\sqrt{3/2} \quad \text{max} \quad \sqrt{3/2}$$

$$\downarrow \quad \uparrow \quad \downarrow \quad \uparrow$$

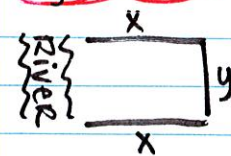
$$\text{min} \quad \text{min}$$

$$x = \pm \sqrt{3/2}$$

AD 28

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$$x + x + y = 2400$$

$$2x + y = 2400$$

$$y = 2400 - 2x$$

$$\text{Area} = x \cdot y$$

$$A = x(2400 - 2x)$$

$$A = 2400x - 2x^2$$

$$A' = 2400 - 4x$$

$$0 = 2400 - 4x$$

$$4x = 2400$$

$$x = 600$$

$$y = 1200$$

$$\text{Abs. max} \\ 600 \times 1200$$