

MATH 1101Y 2009 Quiz 8 (a)

1. A poster is to have a printed area of  $200 \text{ in}^2$  with 1-inch margins at the sides and 2-inch margins at the top and bottom. What dimensions will use the least material?

*Solution:* Let the width of the printed area of the poster be  $x$  and the length be  $y$ . We have  $xy = 200$  and the area of the poster is

$$\begin{aligned} A &= (x + 2)(y + 4) \\ &= (x + 2)\left(\frac{200}{x} + 4\right) \end{aligned}$$

$$\begin{aligned} \frac{dA}{dx} &= \left(\frac{200}{x} + 4\right) + (x + 2)\left(-\frac{200}{x^2}\right) \\ &= \frac{200}{x} + 4 - \frac{200}{x} - \frac{400}{x^2} \\ &= 4 - \frac{400}{x^2}. \end{aligned}$$

Let  $\frac{dA}{dx} = 0$ . We have

$$\begin{aligned} 4 - \frac{400}{x^2} &= 0 \\ \frac{400}{x^2} &= 4 \\ 4x^2 &= 400 \\ x &= 10 \\ y &= 20 \end{aligned}$$

The poster with width 12 and length 24 will use the least material. □