

1.

2.

$$h(x) = x^3 - x^2 - x \text{ com } -2 \leq x \leq 2$$

$$h'(x) = 3x^2 - 2x - 1$$

$$3x^2 - 2x - 1 = 0$$

$$(x_1, x_2) = \left(1, -\frac{1}{3}\right)$$

$$h(1) = -1$$

$$h\left(-\frac{1}{3}\right) = -\frac{1}{27} - \frac{1}{9} + \frac{1}{3}$$

$$h\left(-\frac{1}{3}\right) = -\frac{1}{27} - \frac{3}{27} + \frac{9}{27}$$

$$h\left(-\frac{1}{3}\right) = \frac{5}{27}$$

$$h(-2) = -8 - 4 + 2 = -10$$

$$h(2) = 8 - 4 - 2 = 2$$

$$\text{Min} \implies -10$$

$$\text{Max} \implies 2$$

3.

$$p = A \times v$$

$$\pi r^2 h = 1$$

$$A = 2\pi r^2 + 2\pi r h$$

$$h = \frac{1}{\pi r^2}$$

$$A = 2\pi r^2 + 2\pi r \frac{1}{\pi r^2}$$

$$A = 2\pi r^2 + \frac{2}{r}$$

$$A' = 4\pi r - \frac{2}{r^2}$$

$$4\pi r - \frac{2}{r^2} = 0$$

$$4\pi r^3 - 2 = 0$$

$$r = \sqrt[3]{\frac{1}{2\pi}}$$

$$h = \frac{1}{\pi \sqrt[3]{\frac{1}{4\pi^2}}}$$

4.

$$a + c = 3$$

$$b = 3$$

$$\text{Max}(abc)$$

5. (a)

$$f(t) = t(100 - t) = 100t - t^2$$

$$f'(t) = 100 - 2t$$

$$100 - 2t = 0 \implies t = 50$$

$$f(50) = 50(100 - 50) = 2500$$

(b)

$$f(40) = 2400$$