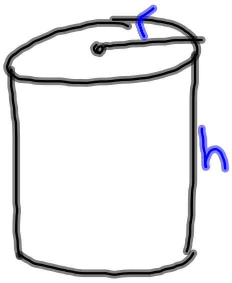
② 

Let r = the radius

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

Express with a single variable

$$V = \pi r^2 h \quad A =$$

$$1000 = \pi r^2 h$$

$$\boxed{h = \frac{1000}{\pi r^2}}$$

$$2\pi r^2 + 2\cancel{\pi}\cancel{r}\left[\frac{1000}{\cancel{\pi} r^{\cancel{2}}}\right]$$

$$A = 2\pi r^2 + 2000 r^{-1}$$

$$A' = 4\pi r - \frac{2000}{r^2}$$

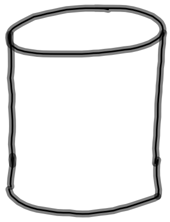
$$\frac{2000}{r^2} = 4\pi r$$

$$4\pi r^3 = 2000$$

$$r^3 = \frac{500}{\pi}$$

$$r = \sqrt[3]{\frac{500}{\pi}} \doteq 5.41 \text{ cm}$$

⑩



$A = 169.56\ cm^2$

$$2\pi r^2 + 2\pi r h = 169.56$$

$$2\pi r h = 169.56 - 2\pi r^2$$

$$h = \boxed{\frac{169.56 - 2\pi r^2}{2\pi r}}$$

$$h = \frac{169.56 - 2\pi(3)^2}{2\pi(3)}$$

$$\boxed{h = 6cm}$$

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

$$V = \cancel{\pi} r^{\cancel{2}}\left[\frac{169.56 - 2\pi r^2}{2\cancel{\pi}\cancel{r}}\right]$$

$$V = \frac{169.56r - 2\pi r^3}{2}$$

$$V = 84.78r - \pi r^3$$

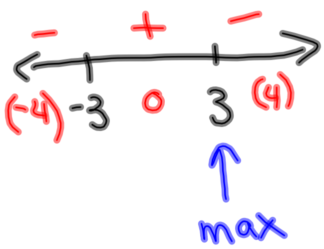
$$V' = 84.78 - 3\pi r^2$$

$$0 = 84.78 - 3\pi r^2$$

$$3\pi r^2 = 84.78$$

$$r^2 = 9$$

$$r = \pm 3$$



$$\boxed{r = 3cm}$$

$$\text{Max Volume} = \pi r^2 h$$

$$= \pi(3)^2(6)$$

$$= 54\pi$$

$$= 169.56\ cm^3$$

① c) $y = x^5 + 8x^3 + x$

$y' = 5x^4 + 24x^2 + 1$

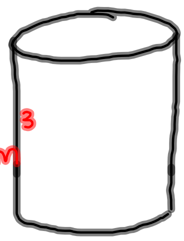
y' is always positive.

The function is always increasing

increasing on $(-\infty, \infty)$

②

$V = 1000\,cm^3$



Let r = radius

$A = 2\pi r^2 + 2\pi r h$ ← Express with a single variable

$V = \pi r^2 h$

$1000 = \pi r^2 h$

$$\boxed{h = \frac{1000}{\pi r^2}}$$

$A = 2\pi r^2 + 2\cancel{\pi}\cancel{r}\left[\frac{1000}{\cancel{\pi} r^{\cancel{2}}}\right]$

$A = 2\pi r^2 + 2000 r^{-1}$

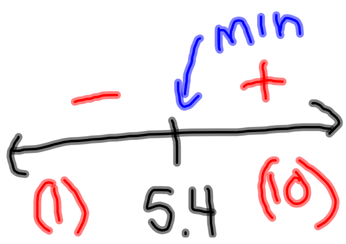
$A' = 4\pi r - \frac{2000}{r^2}$

$\frac{2000}{r^2} = 4\pi r$

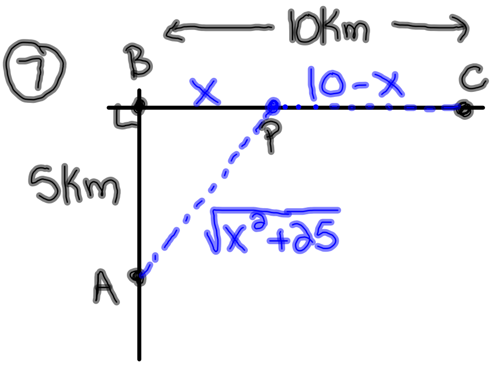
$4\pi r^3 = 2000$

$r^3 = \frac{500}{\pi}$

$r = \sqrt[3]{\frac{500}{\pi}} \doteq 5.4\,cm$



7



Let x = the distance from B to P

$$T = \frac{d}{s}$$

$$T = \frac{\sqrt{x^2+25}}{3} + \frac{10-x}{5}$$

$$T = \frac{1}{3}(x^2+25)^{1/2} + \frac{10}{5} - \frac{1}{5}x$$

$$T' = \frac{1}{\cancel{6}_{3}}(x^2+25)^{-1/2}(\cancel{2}x) - \frac{1}{5}$$

or

$$T' = \frac{x}{3(x^2+25)^{1/2}} - \frac{1}{5}$$

$$T' = \frac{5x - 3\sqrt{x^2+25}}{15\sqrt{x^2+25}}$$

denominator always "+"

$$\frac{1}{5} = \frac{x}{3\sqrt{x^2+25}}$$

$$(5x)^2 = \left(3\sqrt{x^2+25}\right)^2$$

square both sides

$$25x^2 = 9(x^2+25)$$

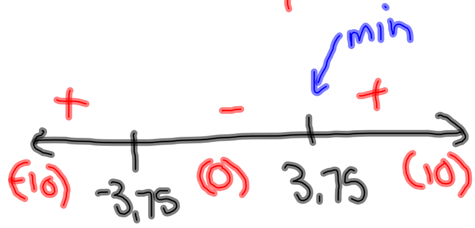
$$25x^2 = 9x^2 + 225$$

$$16x^2 = 225$$

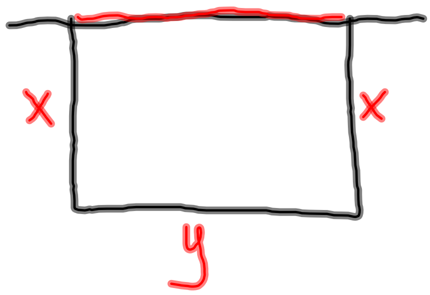
$$x^2 = \frac{225}{16}$$

$$x = \pm\frac{15}{4} = \pm 3.75$$

∴ You should head to a point 3.75Km east of B.



⑧



$P = 2x + y$

$500 = 2x + y$

$\boxed{500 - 2x = y}$

$500 - 2(125) = y$

$500 - 250 = y$

$250\text{m} = y$

$\therefore\ 125\text{m} \times 250\text{m}$

$A = xy$ ← Express as a single variable

$A = x(500 - 2x)$

$A = 500x - 2x^2$

$A' = 500 - 4x$

$4x = 500$

$x = 125\text{m}$