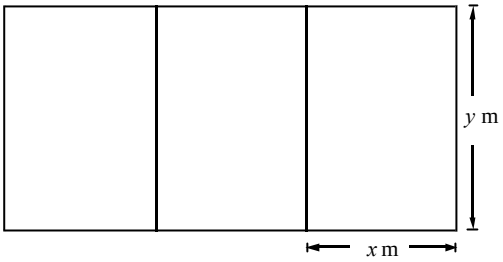
1. The equation of a curve is $y = x^4 - 4x^3$.
一曲線的方程為 $y = x^4 - 4x^3$。

(a) Find the stationary points of the curve. **求曲線的駐點。**

(b) Sketch the curve for $-1 \le x \le 4$. **描繪曲線在** $-1 \le x \le 4$ **的圖像。** (8 marks)

2.



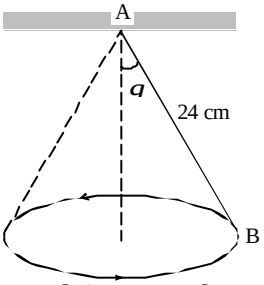
A zoologist is conducting a controlled experiment on breeding sheep. He/She constructs 3 identical rectangular pens using 1200 m of fencing as shown in the figure.
一動物學家正進行一項綿羊繁殖的受控實驗。他利用 1200 m **的籬笆建造三個相同的長方形圍欄，如圖所示。**

(a) Express y in terms of x. **試以** x **表** y。 (2 marks)

(b) Express the total area A, in m^2, in terms of x. **試以** x **表總面積** A (**單位：** m^2) 。 (2 marks)

(c) Find the maximum area he/she can enclose. **求他能圍繞的最大面積。** (6 marks)

3.



A rod AB 24 cm long is hinged with the end A on a ceiling. It is rotated about the vertical line through A to generate a cone. Let q be the semi-vertical angle of the cone and V cm^3 be the volume of the cone.
一支長 24 cm **的棍棒** AB**，其一端** A **懸於天花板。該棍棒繞著經過** A **的垂直線旋轉而形成一圓錐體。設圓錐體的半頂角為** q **及體積為** V cm^3。

(a) Express V in terms of q. **試以** q **表** V 。 (3 marks)

(b) If q increases at the rate of $\frac{p}{30}$ radians per second, find **若** q **的遞增率為** $\frac{p}{30}$ **弧度/s，求**

(i) the rate of change of V when $q = \frac{p}{6}$, **當** $q = \frac{p}{6}$ **時，** V **的變化率，**

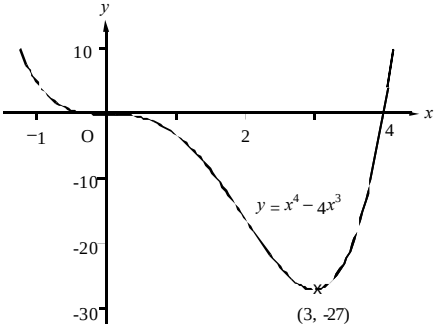
(ii) the range of q such that V is increasing. q **的範圍使** V **遞增。** (7 marks)

完

答案：

1 (a) (0, 0), (3, –27).

(b)



2 (a) $y = 300 - \frac{3x}{2}$

(b) $A = 900x - \frac{9x^2}{2}$

(c) 45 000 m^2.

3 (a) $V = 4608p\sin^2 q \cos q$

(b) (i) $192p^2$ cm^3/s.

(ii) $0 < q < \sin^{-1}\sqrt{\frac{2}{3}}$.