4 **(a)** a progressive wave, state what is meant by *wavelength*.

.....

..... [1]

(b) A light wave from a laser has a wavelength of 460 nm in a vacuum.

Calculate the period of the wave.

period = ... s [3]

(c) The light from the laser is incident normally on a diffraction grating.

Describe the diffraction of the light waves at the grating.

.....

.....

..... [2]

(d) A diffraction grating is used with different wavelengths of visible light. The angle θ of the **fourth**-order maximum from the zero-order (central) maximum is measured for each wavelength. The variation with wavelength λ of $\sin\theta$ is shown in Fig. 4.1.

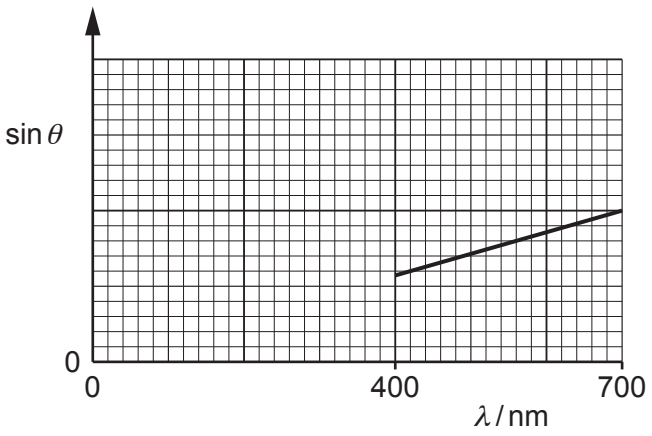

Fig. 4.1

(i) The gradient of the graph is G.

Determine an expression, in terms of G, for the distance d between the centres of two adjacent slits in the diffraction grating.

d = ... [2]

(ii) On Fig. 4.1, sketch a graph to show the results that would be obtained for the **second**-order maxima. [2]

[Total: 10]