4 **(a)** A diffraction grating is used to determine the wavelength of light.

(i) Explain what is meant by the diffraction of light.

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……..…….. [2]

(ii) Given that the diffraction grating has *N l*ines per meter and the wavelength of light is λ, explain using equations how the maximum order of lines can be deduced.

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……..…….. [2]

(b) A diffraction grating is used with different wavelengths of light. The angle θ of the second order maximum is measured for each wavelength. The variation with wavelength λ of $\sin\theta$ is shown in **Fig. 4**.

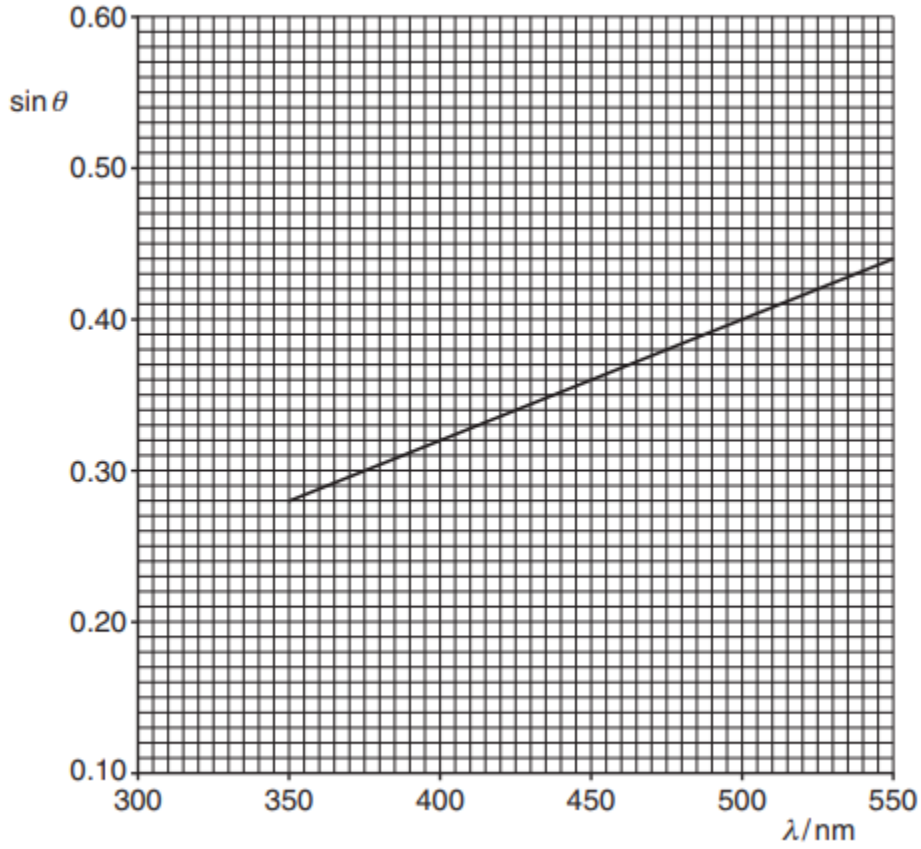

Fig. 4

(i) Determine the gradient of the line shown in **Fig. 4**.

Gradient = …… [2]

(ii) Use the gradient in **(i)** to calculate the slit separation *d* of the diffraction grating.

d = …….. m [2]

(iii) Explain how the line in **Fig. 4** will change for the 1st order maximum with respect to its gradient and vertical intercept.

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……..…….. [2]