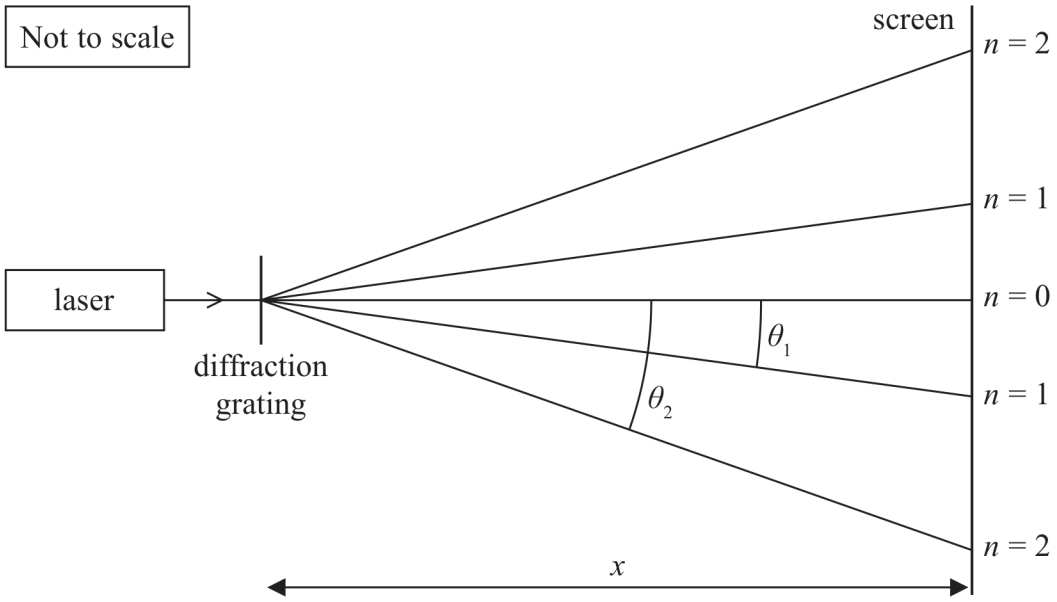
18 A student directed light from a laser so that the light was incident on a diffraction grating at 90°. The student placed a screen a distance x from the grating and observed a series of bright maxima of order n on the screen.

The student determined the value of θ_1 shown on the diagram.



The angle θ_1 is 14.0°.

(a) Calculate the angle θ_2.

(2)

θ_2 = ...

(b) The student measured θ for values of n from 1 to 4.

Describe how a graphical method can be used to determine the wavelength of the light from the laser. Assume that the value of the grating spacing d is known.

(3)

(c) In a separate experiment, the student uses a different diffraction grating that has been labelled as "300 lines per mm" by another student. The distance measured on the screen between the $n = 0$ maximum and the $n = 2$ maximum is 0.397 m.

Deduce whether the labelling of the diffraction grating is correct.

distance x from diffraction grating to screen = 2.00 m
wavelength of laser light = 650 nm

(4)

(Total for Question 18 = 9 marks)