(b) The acceleration of a racing car at a speed of v m/s is
$$\left(1 - \frac{v^2}{3200}\right) \text{ m/s}^2$$

The car starts from rest.

Calculate correct to two decimal places

      (i)   the speed of the car when it has travelled 1500 m from rest

      (ii)   the maximum speed of the car.

(i)
$$v \frac{dv}{dx} = \left(1 - \frac{v^2}{3200}\right)$$

$$\int_0^v \frac{3200v}{3200 - v^2} \, dv = \int_0^{1500} dx \qquad 5$$

$$\left[-1600 \ln\left(3200 - v^2\right)\right]_0^v = \left[x\right]_0^{1500} \qquad 5$$

$$1600 \ln 3200 - 1600 \ln\left(3200 - v^2\right) = 1500$$

$$\frac{3200}{3200 - v^2} = e^{15/16} \qquad 5$$

$$\Rightarrow v = 44.12 \text{ m/s} \qquad 5$$

(ii)   acceleration = 0

$$1 - \frac{v^2}{3200} = 0 \qquad 5$$

$$\Rightarrow v = 56.57 \text{ m/s} \qquad 5 \qquad \boxed{30}$$