5. A student models the motion of a raindrop as it falls towards the ground by the differential equation

$$(t + 4)\frac{dv}{dt} + 5v = 10(t + 4)$$

where $v\,\text{m}\,\text{s}^{-1}$ is the velocity of the raindrop t seconds after it starts to fall from a cloud.

The student assumes that the raindrop is initially at rest.

(a) Find, according to the model, the velocity of the raindrop after 3 seconds.

(6)

(b) Describe the motion of the raindrop for large values of t according to the student's model.

(1)

(c) State a limitation of the model.

(1)