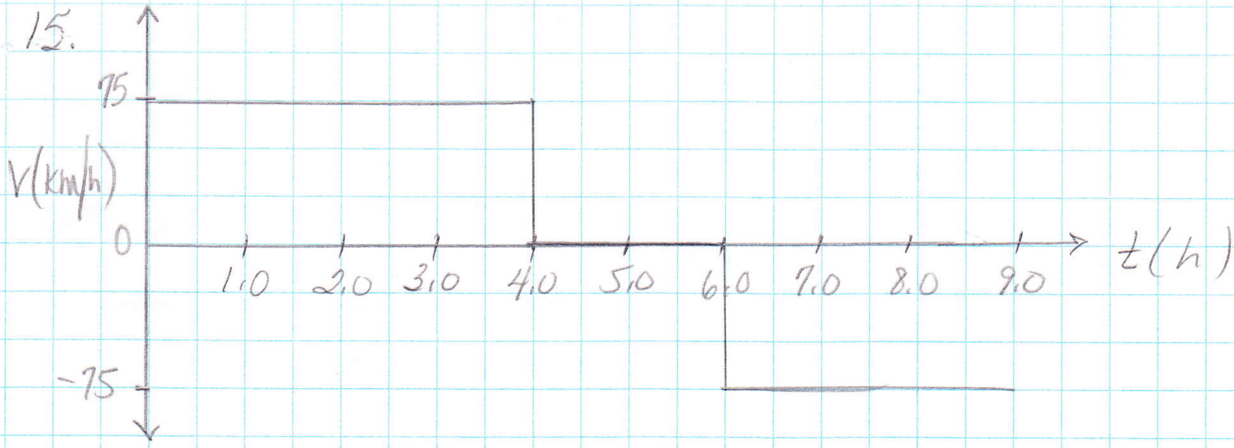
15.



B) area = 4.0h (75km/h) = 300 km

c) distance : add the absolute value of the areas under the curve on a v-t graph.

displacement : add the areas under the curve on a v-t graph.

16. ① $v = +25 m/s$

$t = 10.0 min$

② $v = +1.5 m/s$ $d = vt = +1.5 m/s \left(20.0 min \times \frac{60 s}{1 min}\right)$

$t = 20.0 min$ $d = 1800 m$

③ $v = 0 m/s$

$t = 10.0 min$

④ $v = -1.2 m/s$ $t = \frac{d}{v} = \frac{-1800 m}{-1.2 m/s} = 1500 s \Rightarrow 25 min$

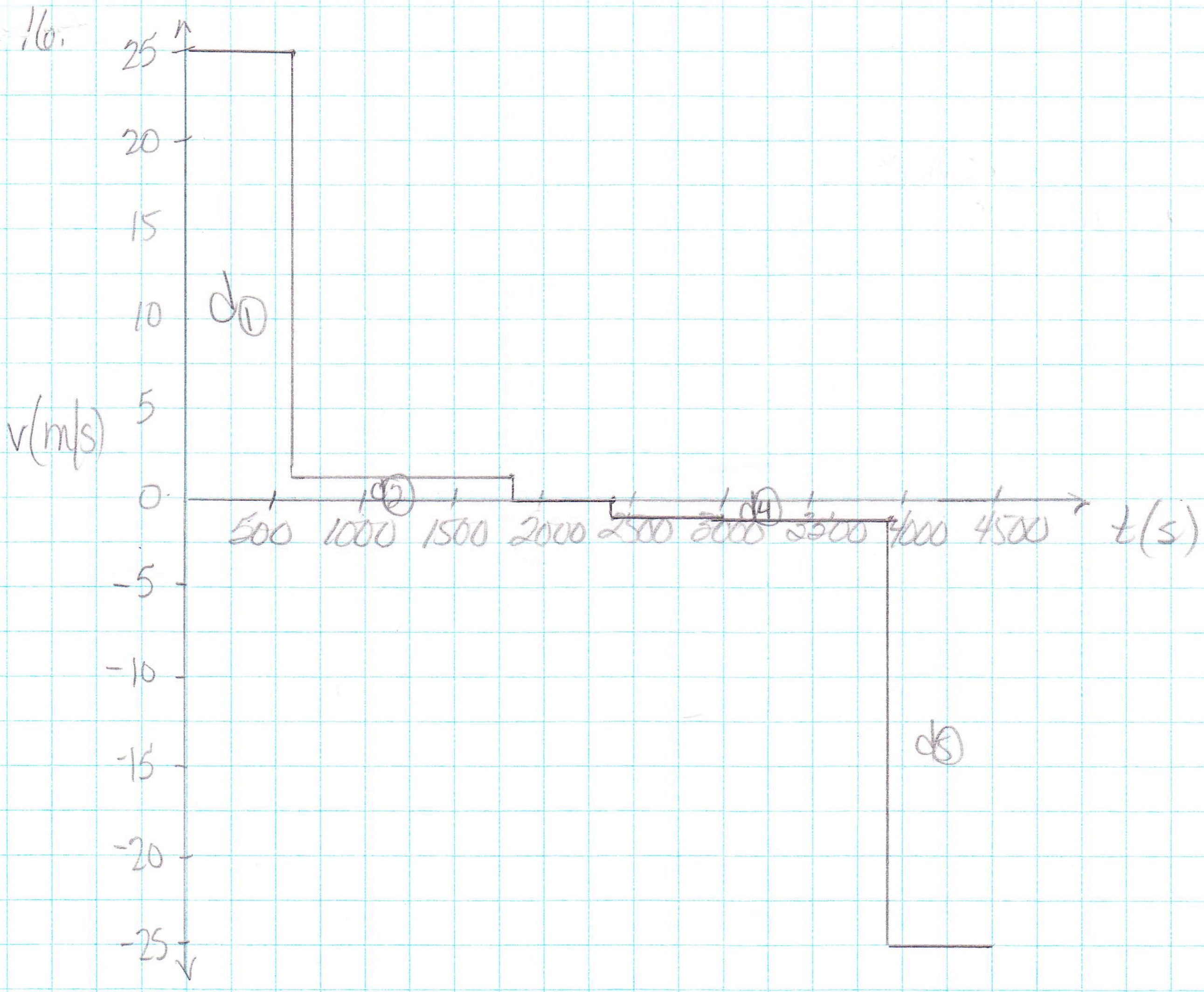
⑤ $v = -25 m/s$ $t = 10.0 min$ (same as ①)

$t_{①} = 10.0 min \times \frac{60 s}{1 min} = 6\bar{0}0 s$

$t_{②} = 20.0 min \times \frac{60 s}{1 min} = 12\bar{0}0 s$

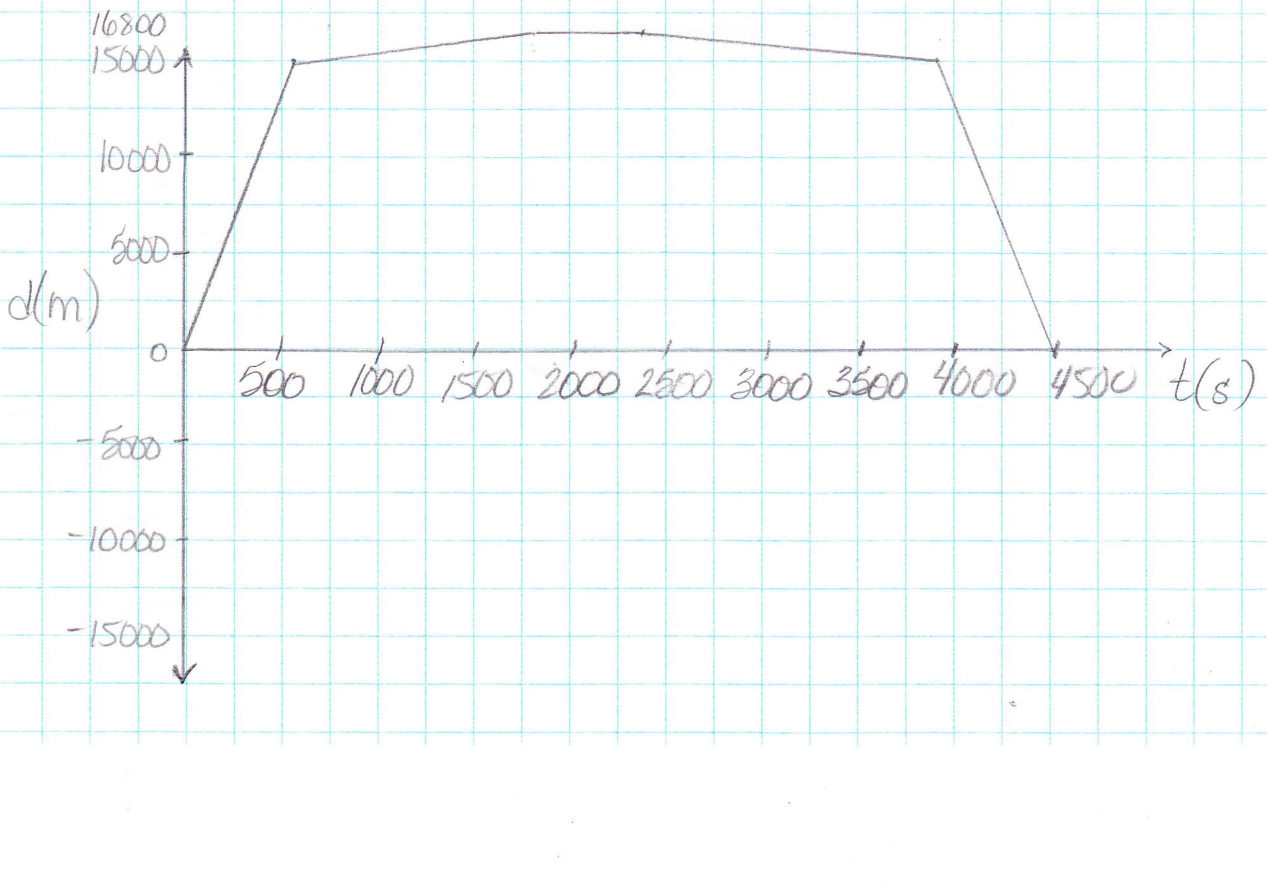
$t_{TOTAL} = t_{①} + t_{②} + t_{③} + t_{④} + t_{⑤} = 4500 s$

16.



$d_{①} = 600s(+25m/s) = 15000\,m$　　$d_{②} = 1200s(+1.5m/s) = 1800m$

$d_{④} = 1500s(-1.2m/s) = -1800m$　　$d_{⑤} = 600s(-25m/s) = -15000m$



Constant Acceleration Worksheet

1. $V_i = 25 m/s$
$V_f = -35 m/s$
$t = 0.010 s$

$$a = \frac{V_f - V_i}{t} = \frac{-35 m/s - 25 m/s}{0.010 s} = -6.0 \times 10^3 m/s^2$$

* negative because it is speeding up in a negative direction

2. a) $V_i = 20. km/h$
$V_f = 30. km/h$
$t = 1.5 s$

$$a = \frac{V_f - V_i}{t} = \frac{30. km/h - 20. km/h}{1.5 s \times \frac{1 h}{3600 s}} = 24000 km/h^2$$

b) $a = 24000 km/h^2$
$t = ?$
$V_i = 30. km/h$
$V_f = 36 km/h$

$$t = \frac{V_f - V_i}{a} = \frac{36 km/h - 30. km/h}{24000 km} = 0.00025 h$$

$$t = 0.00025 h \times \frac{3600 s}{1 h} = 0.92 s$$

3. $a = 8.0\,m/s^2$

a) $t = ?$

$V_i = 0\,m/s$

$V_f = 24\,m/s$

$$t = \frac{V_f - V_i}{a} = \frac{24\,m/s - 0\,m/s}{8.0\,m/s^2} = 3.0\,s$$

b) $d = \cancelto{0}{V_i t} + \frac{1}{2}at^2$

$= \frac{1}{2}(8.0\,m/s^2)(3.0\,s)^2$

$= 36\,m$

4. $V_i = 0\,m/s$

$a = 2.0\,m/s^2$

$d = 200.\,m$

$V_f = ?$

$$V_f = \sqrt{\cancelto{0}{V_i^2} + 2ad}$$

$$= \sqrt{2(2.0\,m/s^2)(200.\,m)}$$

$$V_f = 28\,m/s$$

5. $V_i = 0\,m/s$

$V_f = 50.\,m/s$

$a = ?$

$d = 500.\,m$

$$a = \frac{V_f^2 - V_i^2}{2d} = \frac{(50.\,m/s)^2 - (0\,m/s)^2}{2(500.\,m)} = 2.5\,m/s^2$$

6. $V_i = 0\,m/s$

$V_f = 100.\,km/h = 27.8\,m/s$

$a = 2.0\,m/s^2$

$d = 150.\,m$

$$V_f = \sqrt{\overset{\to 0}{\cancel{V_i^2}} + 2ad}$$

$$= \sqrt{2(2.0\,m/s^2)(150.\,m)}$$

$$= 24.5\,m/s$$

With this runway, the maximum velocity a plane can reach with this acceleration is 24.5m/s. Therefore, it is not long enough for the plane that needs to reach 27.8m/s.

7. $t = ?$

$d = 30.0\,m$

$V_i = 0\,m/s$

$a = 2.00\,m/s^2$

$$d = \overset{\to 0}{\cancel{V_i t}} + \tfrac{1}{2}at^2$$

$$t = \sqrt{\frac{2d}{a}} = \sqrt{\frac{2(30.0\,m)}{2.00\,m/s^2}} = 5.48\,s$$

8. $V_f = 0\,m/s$

$d = 320.\,m$

$a = -10.\,m/s^2$

$V_i = ?$

$$V_f^2 = V_i^2 + 2ad$$

$$V_i = \sqrt{\overset{\to 0}{\cancel{V_f^2}} - 2ad}$$

$$= \sqrt{-(2)(-10.\,m/s^2)(320.\,m)}$$

$$V_i = 80.\,m/s$$