

Rates of Change Solutions

1 Rates of Change

1. -50 people per year
2. i. 35m/sec
ii. $20m/sec^2$
3. i. 60 secs
ii. 18km
4. i. 8m
ii. When $t = 0$ or $t = 1\frac{1}{3}$ secs
5. i. $t = \frac{2}{3}$, acceleration = -2; $t = 1$, acceleration = 2
ii. $t = \frac{5}{6}$, velocity = $-\frac{1}{6}$
6. i. 3 cm to the left of O moving to the right at 24 cm/ sec
ii. $v = 3t^2 - 22t + 24$
iii. After $\frac{4}{3}$ sec and 6 sec
iv. $11\frac{22}{27}$ cm to the right of O and 39 cm to the left of O
v. $4\frac{2}{3}$ sec
vi. $a = 6t - 22$
vii. When $t = \frac{11}{3}$ sec and the particle is $13\frac{16}{27}$ cm left of O moving to the left at $16\frac{1}{3}$ cm/sec
7. i. 16 m
ii. 25 m
iii. $2tm/s$
iv. 8 m/s
8. i. $acc=9.8m/s^2$ downward at all times
ii. max height =4.9 m
iii. ball strikes ground at 9.8 m/s
9. i. 4.318 s

- ii. -23.1582 m/s
 - iii. 2.159 s .
10. time 27.8 s ; distance 771.6 m
11. i. $4h \text{ m}$
- ii. $\sqrt{2}v \text{ m/s}$
12. 400 ft
13. 0.833 km
14. i.

$$v = \begin{cases} 2t & \text{if } 0 < t \leq 2 \\ 4 & \text{if } 2 < t < 8 \\ 20 - 2t & \text{if } 8 \leq t < 10 \end{cases}$$

- ii. v is continuous for $0 \leq t \leq 10$
- iii.

$$a = \begin{cases} 2 & \text{if } 0 < t < 2 \\ 0 & \text{if } 2 < t < 8 \\ -2 & \text{if } 8 < t < 10 \end{cases}$$

- iv. a is continuous except at $t = 2$ and $t = 8$.
- v. maximum velocity 4 is attained for $2 \leq t \leq 8$