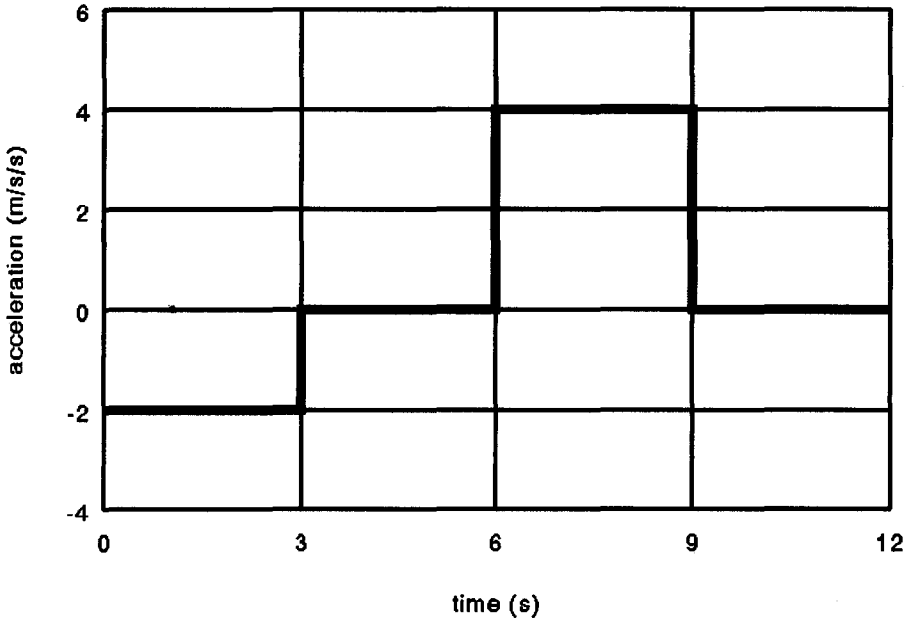
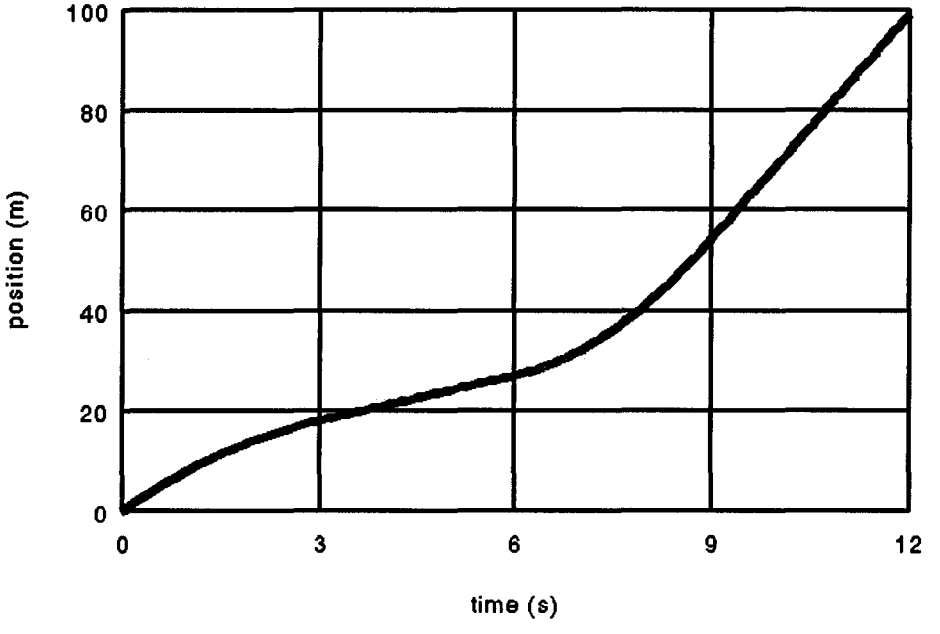
Appendix 3.13
Question 2(a)



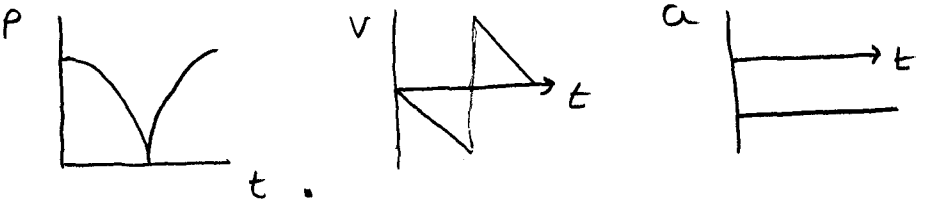
Appendix 3.13
Question 2(b)



Appendix 3.13

1. same as Appendix 3.10 question 1

2. acceleration is slope
   position is area

3. 

4. acceleration is slope

$$a = \frac{6.0 - 2.5}{5.0 - 0} =$$

5. $v_i = 16.7$ m/s
   $a = 2.5$ m/s^2
   $t = 8.1$ s
   $v_f = ?$

$$v_f = v_i + at$$
$$v_f = 16.7 + (2.5)(8.1)$$
$$\underline{v_f = 26.95 \text{ m/s}}$$

6. $v_i = 28.4$ m/s
   $v_f = 0$
   $a = -3.8$ m/s^2
   $t = ?$

$$v_f = v_i + at$$
$$0 = 28.4 + (-3.8)t$$
$$-28.4 = -3.8t$$
$$\underline{t = 7.47 \text{ s}}$$

7. $v_i = 22$ m/s
   $v_f = 34$ m/s
   $t = 3.5$ s
   $d = ?$

$$d = \left(\frac{v_i + v_f}{2}\right)t$$
$$= \left(\frac{22 + 34}{2}\right)3.5$$
$$\underline{d = 98 \text{ m}}$$

8. $v_i = 0$
   $d = 30$ m
   $t = 3.5$ s
   $a = ?$

$$v_f = v_i + at$$
$$17.14 = 0 + a(3.5)$$
$$\underline{a = 4.90 \text{ m/s}^2}$$

$$d = \left(\frac{v_i + v_f}{2}\right)t$$
$$30 = \left(\frac{0 + v_f}{2}\right)3.5$$
$$60 = v_f(3.5)$$
$$v_f = 17.14 \text{ m/s}$$

9. $a = 18.7\ m/s^2$
$v_i = 3.6\ m/s$
$v_f = 8.5\ m/s$
$d = ?$

$d = \left(\frac{v_i + v_f}{2}\right)t$

$d = \left(\frac{3.6 + 8.5}{2}\right)(0.26)$

$d = 1.57\ m$

$v_f = v_i + at$

$8.5 = 3.6 + 18.7t$

$4.9 = 18.7t$

$t = 0.26\ s$

10. $v_i = 12.5\ m/s$
$d = 3.5\ m$
$t = 0.24\ s$
$v_f = ?$

$d = \left(\frac{v_i + v_f}{2}\right)t$

$3.5 = \left(\frac{12.5 + v_f}{2}\right)(0.24)$

$7 = (12.5 + v_f)(0.24)$

$29.17 = 12.5 + v_f$

$v_f = 16.67\ m/s$

11. $v_i = 32\ m/s$
$v_f = 25\ m/s$
$d = 20\ m$
$a = ?$

$v_f = v_i + at$

$25 = 32 + a(0.70)$

$-7 = a(0.70)$

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

$d = \left(\frac{v_i + v_f}{2}\right)t$

$20 = \left(\frac{32 + 25}{2}\right)t$

$20 = 28.5t$

$t = 0.70\ s$

12. $v_i = 17.1\ m/s$
$t = 2.5\ s$
$d = 63.5\ m$
$a = ?$

$v_f = v_i + at$

$33.7 = 17.1 + a(2.5)$

$16.6 = a(2.5)$

$a = 6.64\ m/s^2$

$d = \left(\frac{v_i + v_f}{2}\right)t$

$63.5 = \left(\frac{17.1 + v_f}{2}\right)2.5$

$127 = (17.1 + v_f)2.5$

$50.8 = 17.1 + v_f$

$v_f = 33.7\ m/s$

13. $v_i = 47\ m/s$
$v_f = 0$
$d = 0.35\ m$
$a = ?$

$v_f = v_i + at$

$0 = 47 + a(0.015)$

$-47 = a(0.015)$

$a = -3133.33\ m/s^2$

$d = \left(\frac{v_i + v_f}{2}\right)t$

$0.35 = \left(\frac{47 + 0}{2}\right)t$

$.7 = 47t$

$t = 0.015\ s$

14. before braking

$V = 26.5\ m/s$

$t = 0.45\ s$

$d = ?$

$V = \frac{d}{t}$

$26.5 = \frac{d}{0.45}$

$d = 11.93\ m$

after braking

$V_i = 26.5\ m/s$

$V_f = 0$

$a = -8.5\ m/s^2$

$d = ?$

$d = \left(\frac{V_i + V_f}{2}\right) t$

$= \left(\frac{26.5 + 0}{2}\right) 3.12$

$= (13.25)\,3.12$

$d = 41.34\ m$

$V_f = V_i + at$

$0 = 26.5 - 8.5t$

$-26.5 = -8.5t$

$t = 3.12\ s$

∴ The total distance is $11.93\ m + 41.34\ m = \underline{53.27\ m}$

15. (a) $V_i = 0$

$a = 1.5\ m/s^2$

$t = 5\ s$

$d = ?$

$d = \left(\frac{V_i + V_f}{2}\right) t$

$d = \left(\frac{0 + 7.5}{2}\right) 5$

$= 3.75(5)$

$\underline{d = 18.75\ m}$

$V_f = V_i + at$

$V_f = 0 + 1.5(5)$

$V_f = 7.5\ m/s$

(b) $7.5\ m/s$

(c) $V = 7.5\ m/s$

$t = 15\ s$

$d = ?$

$V = \frac{d}{t}$

$7.5 = \frac{d}{15}$

$\underline{d = 112.5\ m}$

15. (d) $v_i = 7.5\ m/s$
$v_f = 0$
$t = 1.8\ s$
$d = ?$

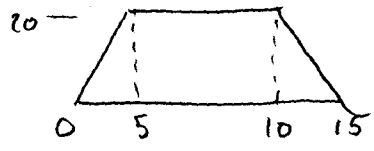
$$d = \left(\frac{v_i + v_f}{2}\right)t$$
$$= \left(\frac{7.5 + 0}{2}\right)1.8$$
$$= (3.75)(1.8)$$
$$\underline{d = 6.75\ m}$$

(e) $18.75\ m + 112.5\ m + 6.75\ m = \underline{138\ m}$

16. (a) $-1.6\ m/s^2$
(b) $-1.6\ m/s^2$
(c) $-1.6\ m/s^2$

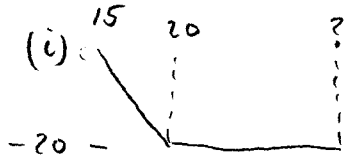
17. (a) 5s (b) 10s (c) 15s (d) 15s (e) yes, 35 (f) no
(g) the car is south of its starting point
- the area under the curve from 15 - 35s is greater than the area under curve from 0 - 15s

(h)



distance = area
$$= \frac{20(5)}{2} + 20(5) + \frac{20(5)}{2}$$
$$= 50 + 100 + 50 = \underline{200m}$$

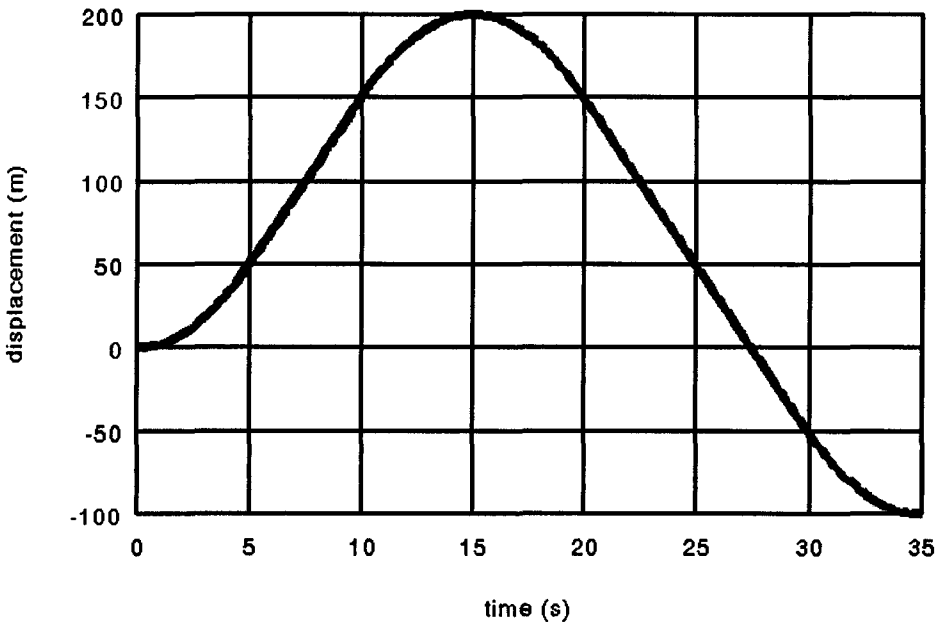
(i)



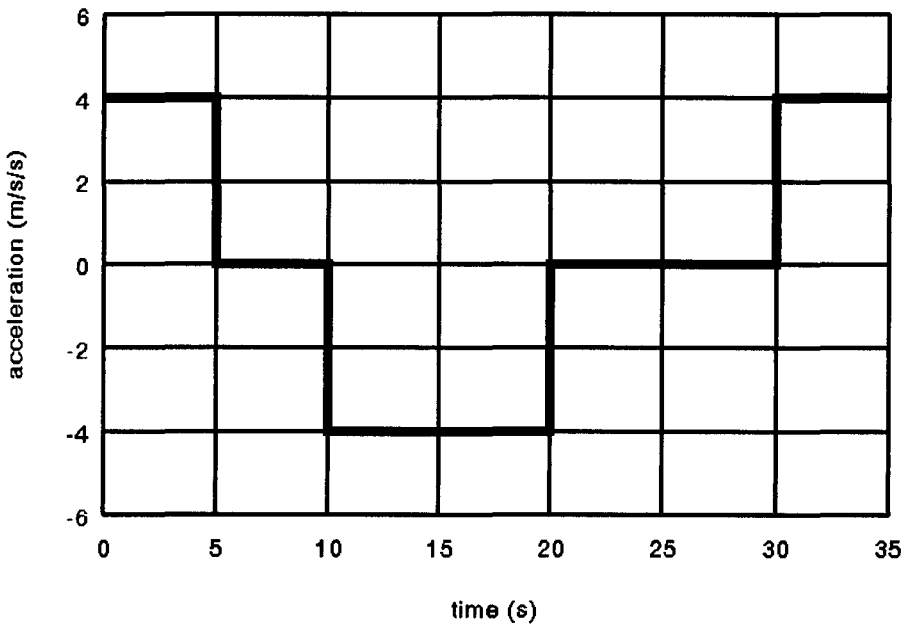
distance = area
$$200 = \frac{20(5)}{2} + 20(?)$$
$$200 = 50 + 20(?)$$
$$150 = 20(?)$$
$$? = 7.5$$

∴ The car returns to its starting point at $20 + 7.5 = \underline{27.5\ s}$

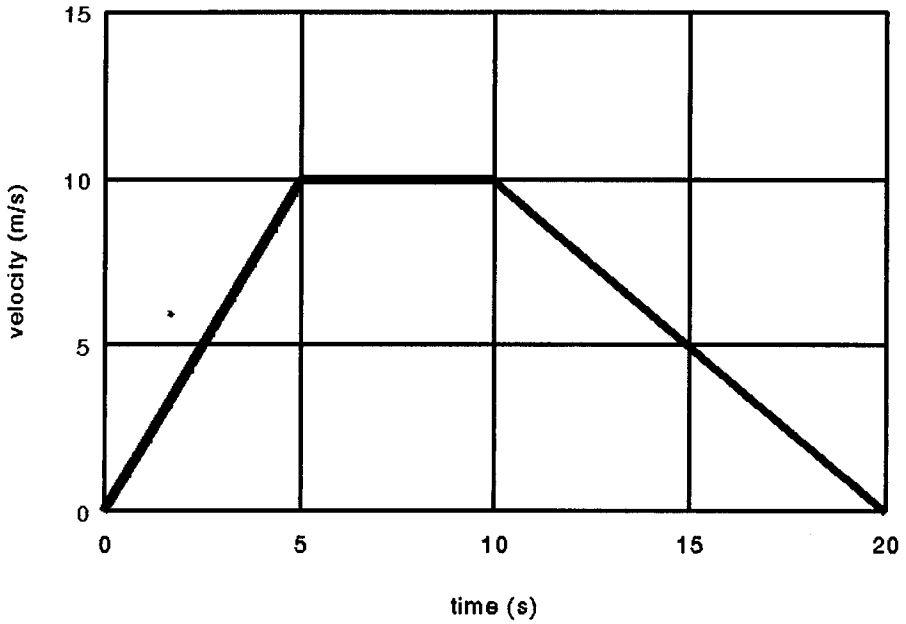
Appendix 3.13
Question 17(j)



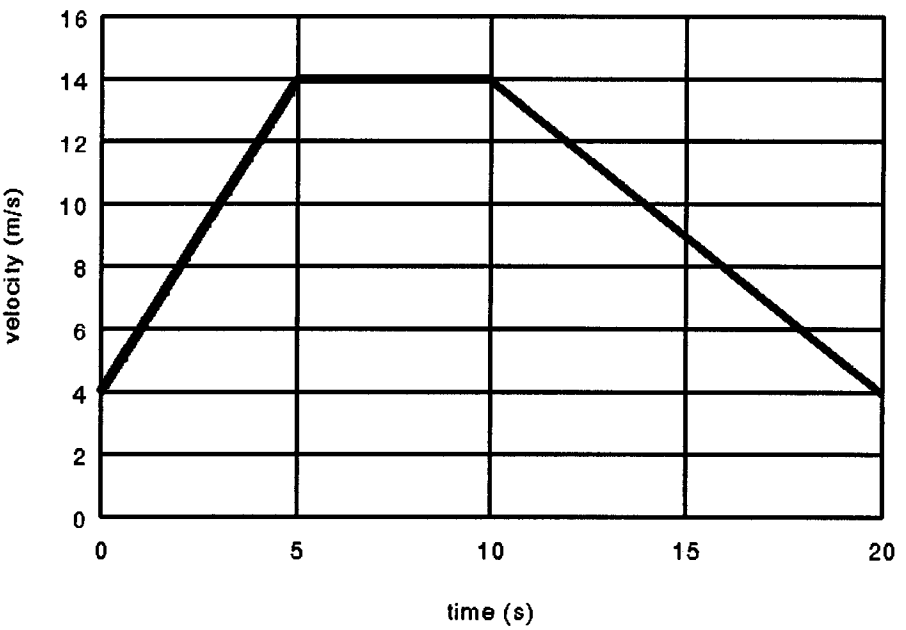
Appendix 3.13
Question 17(k)



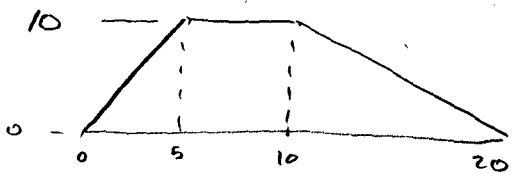
Appendix 3.13
Question 18(a)



Appendix 3.13
Question 18(c)



18. (b)



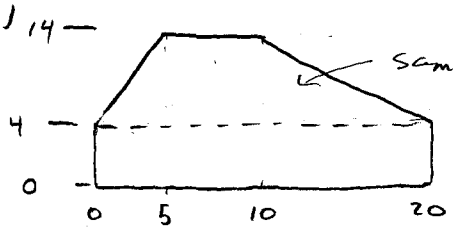
displacement = area

$$= \frac{10(5)}{2} + 10(5) + \frac{10(10)}{2}$$

$$= 25 + 50 + 50$$

$$= \underline{125 \text{ m East}}$$

(d)



same as for part (b) 125 m

displacement = area

$$= 125 + 4(20)$$

$$= \underline{205 \text{ m East}}$$