1

1.1

1. $3(a+b)$
2. $x(x-5)$
3. $2p(2p-3)$
4. $ax(x+1)$
5. $7x(x-2+3y)$
6. $a(b+c+1)$
7. $xy(1-2x+3y)$

1.2

1. $(b+c)(a+d)$
2. $(x+w)(y+z)$
3. $(p+q)(p+r)$
4. $(q-3y)(p+r)$
5. $(2x-a)(3y+5b)$
6. $(5a-2b)(4x+y)$
7. $(p+3)(p-2q)$
8. $(y-4)(x+z)$
9. $(a-2x)(3b-2y)$

1.3

1. $(x+3)(x+4)$
2. $(x+5)(x+3)$
3. $(x-2)(x-6)$
4. $(x-3)(x-7)$
5. $(x+3)(x-7)$
6. $(x-4)(x+3)$
7. $(x-5)(x+4)$
8. $(2x+3)(x+1)$
9. $(2x-3)(x-2)$
10. $(2x+1)(x-5)$
11. $(3x-2)(2x+1)$
12. $(2x-1)(4x+5)$
13. $(5x-3)(2x+1)$

1.4

1. $(x-y)(x+y)$
2. $(a-4b)(a+4b)$
3. $(3m-7n)(3m+7n)$
4. $(10x-1)(10x+1)$
5. $(8a-5b)(8a+5b)$

1.5

1. i. $(5x-7n)(5x+7n)$
   ii. $(2x+3)(x-6)$
2. $(c-d)(a+b)$
3. $(x+10)(x-3)$
4. $(n-1)(n+1)$
5. (a) $(3a-2b)(3a+4c)$
   (b) $(3x-4y)(3x+4y)$
   (c) $\dfrac{2x}{2x-3}$
6. i. $5x^2(x-2)$
   ii. $(2x-9y)(2x+9y)$
   iii. $(a-b)(a+3)$

2

1. i. $x = 3 \quad x = -10$
   ii. $x = -\frac{1}{2} \quad x = -2$
   iii. $x = 0 \quad x = 1$
   iv. $x = 1 \quad x = -1$
   v. $x = -7 \quad x = 2$
   vi. $x = 6 \quad x = -1$
   vii. $x = \frac{3}{2} \quad x = -\frac{3}{2}$
   viii. $x = 0 \quad x = \frac{4}{3}$
   ix. $x = \frac{1}{3} \quad x = -4$
   x. $x = \frac{1}{4} \quad x = \frac{3}{2}$
   xi. $x = 0 \quad x = 2$
2. i. $x = 5.46 \quad x = -1.46$
   ii. $x = 4.59 \quad x = -1.09$
   iii. $x = 4.21 \quad x = -0.71$
   iv. $x = 2.72 \quad x = 0.61$

2.1

1. $x = -6 \quad x = 2$
2. $x = 6 \quad x = -3$
3. $x = 4 \quad x + 1 = 5$
4. $x = 6 \quad x + 2 = 8$
5. Width $= 3$ Length $= 7$
6. i. $x + 1$
   $x - 2$
   ii. $(x + 1)(x - 2) = 1$
   $x^2 - x - 3 = 0$
   iii. $x = 2.303 \quad x = -1.303$
7. (a) $y = 14 \quad y = 3 \quad y = 1.69$
   (b) Because we got different values for y in each equation.
8. i. $(n - 1)(n + 1)$
   ii. 19 and 21
9. $x = 2$ cm
10. $52a^2$
11. (a) Diagram
    (b) $4x^2 + 36x - 63 = 0$
    (c) Length:$10 + 2x$ Width:$8 + 2x$
    (d) $4x^2 + 36x - 63$
    (e) $x = 1.5$m
12. i. $x = \sqrt{18} = 3\sqrt{2}$
    ii. $y = \sqrt{8} = 2\sqrt{2}$
    iii. $10\sqrt{2}$ units

3

1. $x = 2 \quad y = 1$
2. $x = -2 \quad y = 5$
3. $x = 4 \quad y = -\frac{10}{3}$

3.1

1. $x = 3 \quad y = 2$
2. Bar €0.90 Drink €1.20
3. Car €2.10 Van €2.90

4

1. i. Linear
   ii. Quadratic
   iii. Exponential
   iv. Linear
   v. Exponential
   vi. Quadratic

4.1

2. i. Proof
   ii. $T_n = 3n - 1$
   iii. $T_{15} = 44$
   iv. 16th term

3. i. Proof
   ii. $T_n = 4n - 1$
   iii. $T_{28} = 111$
   iv. 25th term

4. i. Proof
   ii. $T_n = 2n + 3$
   iii. $T_{12} = 27$
   iv. 37th term

5. i. Proof
   ii. $T_n = 13 - 3n$
   iii. $T_{20} = -47$
   iv. 10th term

4.2

6. i. Proof
   ii. ...36,49,64

7. i. Proof
   ii. ...73,99,129

8. i. Proof
   ii. ...48,63,80

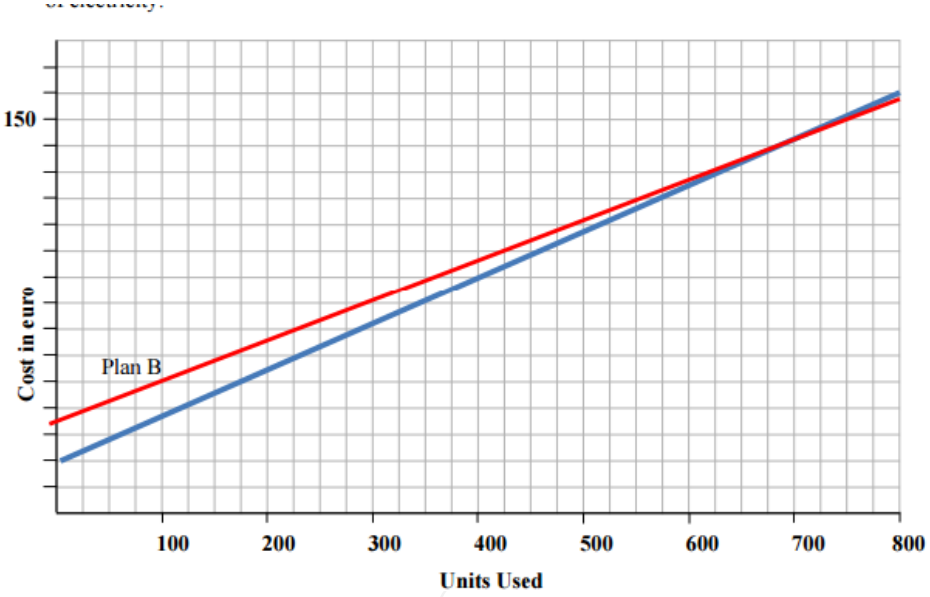
9. i. Proof
   ii. $T_n = 2n^2 + n$
   iii. $T_7 = 105$

10. i. Proof
    ii. $T_n = n^2 + 2n + 1$
    iii. $T_n = 169$

4.3

1. i. Quadratic.....because the 2nd difference is constant.
   ii. 5.2 m
   iii. 4.4 seconds

2. (a) Linear....1st difference is constant.



(b)

(c) €20

(d) When units deccrease by 100, teh price decreases by €18.
€38 - €18 = €20.

(e) $C = 20 + 0.18n$

(f) 13.5%

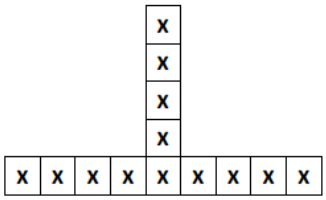
Units Used	Plan B Cost in euro
100	€51·50
200	€67·00
300	€82·50
400	€98·00
500	€113·50
600	€129·00
700	€144·50
800	€160·00

(g)

(h) If she uses a small amount of units she should choose Plan A, if she uses a large number of units she should choose Plan B.

(i) See graph above

(j) 640 units



3. (a)

(b) $N = 3S + 2$

(c) $k = 42$

(d) diagram (ii) $p + 6$

5

5.1

1. (a) $x = 6 \quad x = -3$

(b) $f(0) = -18$

(c) Diagram

2. (a) $x = 0 \quad x = 4$

(b) $f(0) = 0$

(c) Diagram

3. (a) $x = \frac{3}{2} \quad x = -\frac{3}{2}$

(b) $f(0) = -9$

(c) Diagram

4. (a) $x = 6 \quad x = -\frac{3}{2}$

(b) $f(0) = -18$

(c) Diagram

5. i. $A(-2, 0), B(4, 0), C(0, -8)$

ii. $-2 \leq x \leq 8$

6. (a) $x = -4 \quad x = 3$

(b) $f(x) = x^2 + x - 12$

7. (a) $x = -4 \quad x = 2$

(b) $g(x) = x^2 + 2x - 8$

8. (a) $x = 0 \quad x = 3$

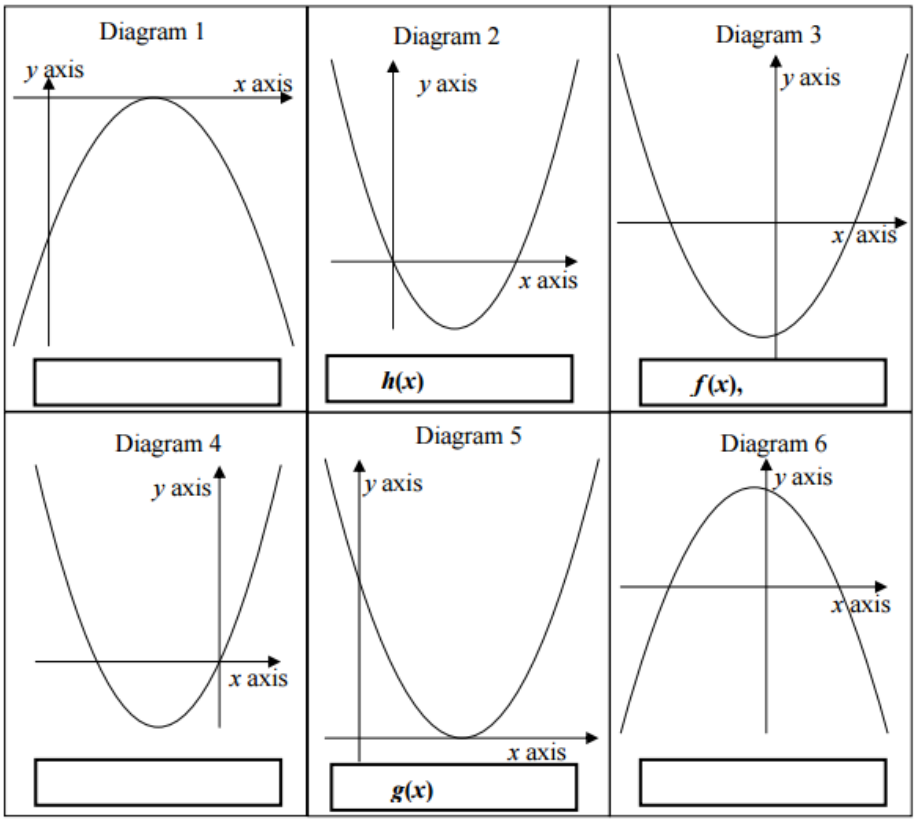
   (b) $h(x) = x^2 - 3x$

9. (a) $x = -4 \quad x = 4$

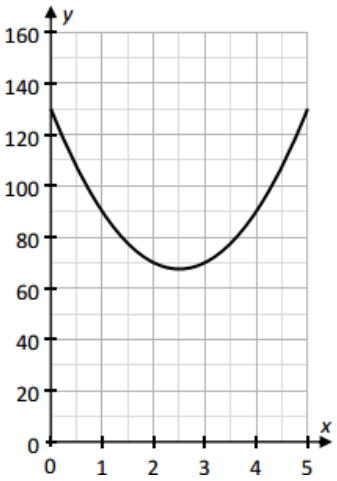
   (b) $f(x) = x^2 - 16$

10. (b) $h(x) : x = -2 \quad x = 3$ Equation: $h(x) = x^2 - x - 6$
    $k(x) : x = -3 \quad x = 2$ Equation: $k(x) = x^2 + x - 6$

11. (a) i. $x = \frac{3}{2} \quad x = -2$
    ii. $x = 3$
    iii. $x = 0 \quad x = 2$



(b)

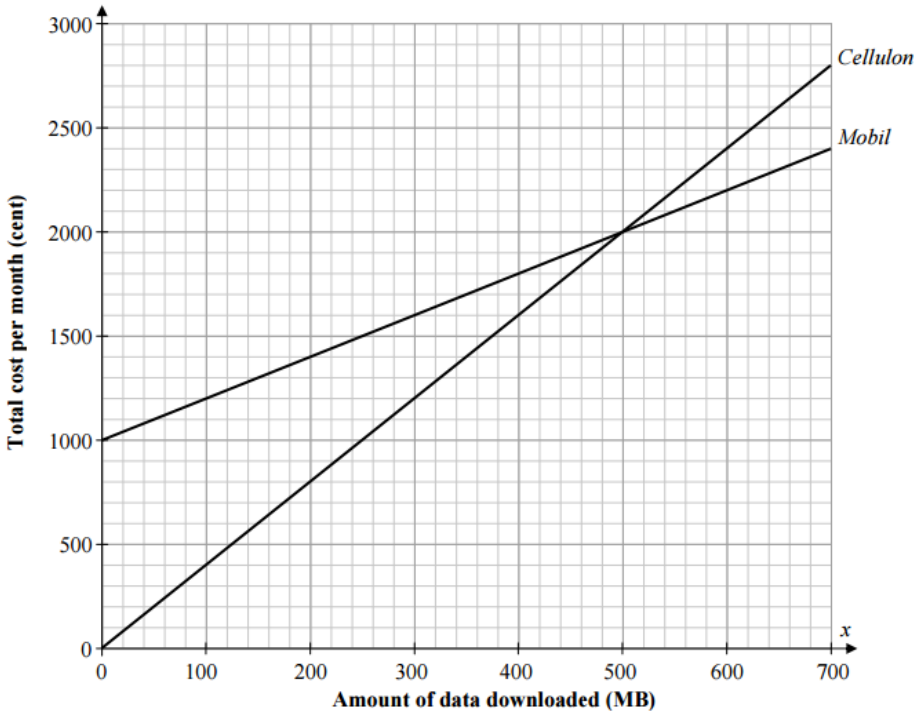


12. (a)

(b) i. 130 cm

ii. 68 cm

iii. 2 hours 30 minutes

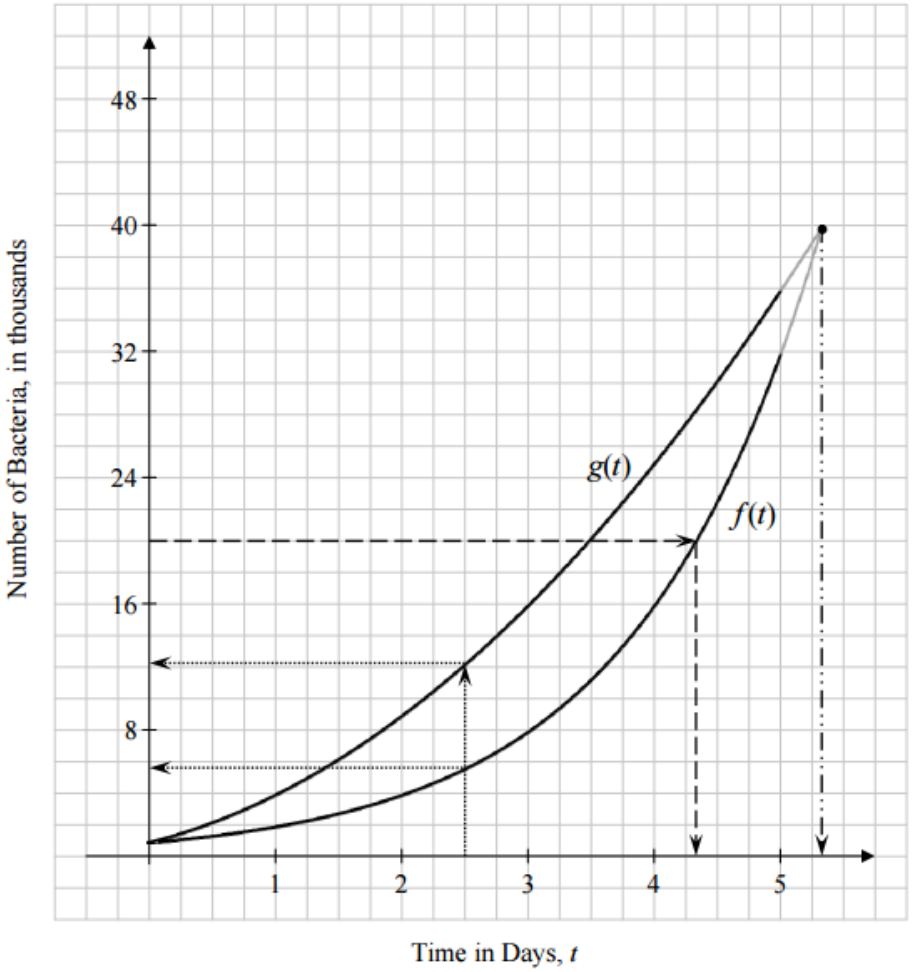


13. (a)

(b) Cellulon charge no fixed fee. The graph begins at the origin so they charge €0 for 0MB data.

(c) (500,2000)

(d) If Fergus uses less than 500 MB he shoulg go with Cellulon, otherwise he should go with Mobil.



14. i.
    ii. 6500
    iii. $t \geq 4.3$ days
    iv. 5.3 days
    v. Paul's formula is more accurate

5.2

1. A function $f(x)$ is defined as $f(x) = x + 2$. Find:
   (a) $f(1) = 3$
   (b) $f(3) = 11$
   (c) $f(-1) = 1$
   (d) $f(-2) = 0$
2. If $f(x) = 3x - 2$, find:
   (a) $f(3) = 7$
   (b) $f(4) + f(2) = 14$

(c) $4 + f(2) = 8$

(d) $f(\frac{1}{2}) = -\frac{1}{2}$

(e) $f(3) - f(1) = 6$

(f) $3 - f(1) = 2$

3. If $f(x) = 2x + 4$, find:

(a) $f(3) + f(5) = 24$

(b) $f(3) + 5 = 15$

(c) $3f(5) = 42$

(d) $5f(3) = 50$

Find in terms of k

(e) $f(k) = 2k + 4$

(f) $f(3k) = 6k + 4$

(g) $f(k + 3) = 2k + 10$

(h) $f(k) + 3 = 2k + 7$

4. (a) $f(7) = 26$

(b) $f(k) = 3k + 5$

(c) $x = -\frac{5}{2}$

5. If $f(x) = 3 - 4x$, Solve for x:

(a) $x = 2$

(b) $x = \frac{3}{5}$

(c) $x = -1$

(d) $x = -3$

(e) $x = \frac{1}{2}$

6. (a) $g(3) = 1$

(b) i. $h(t) = t^2 - 3t \quad h(2t + 1) = 4t^2 - 2t - 2$

ii. $t = \frac{2}{3} \quad t = -1$

5.3

1. $b = 3$
2. $a = 2$
3. $a = 2.5$
4. $r = 3$
5. $a = 1\ b = -2$
6. $a = -2\ b = 4$

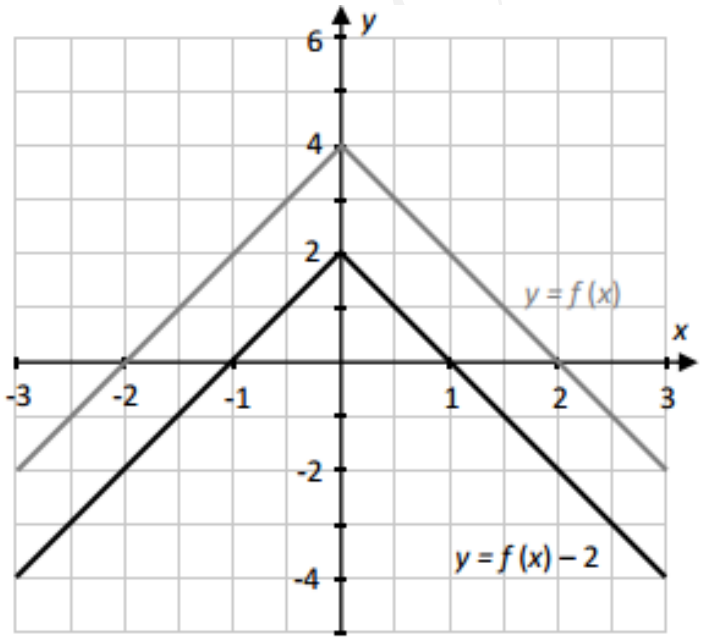
7. (a) $2a + b = -1 \quad -5a + b = -29$
   (b) $a = 4 \quad b = -9$
   (c) $(0, -9)$
   (d) $(-5.6, 0) \quad (1.6, 0)$

8. i. $q = 10$
   ii. $p = -3$
   iii. $(5, 0)$
   (c)
   i. $c = 180$
   ii. $a = 20 \quad b = -120$

9. (a) i. .

x	−3	−2	−1	0	1	2	3
$f(x)$	−2	0	2	4	2	0	−2
$f(x) - 2$	−4	−2	0	2	0	−2	−4

ii. .

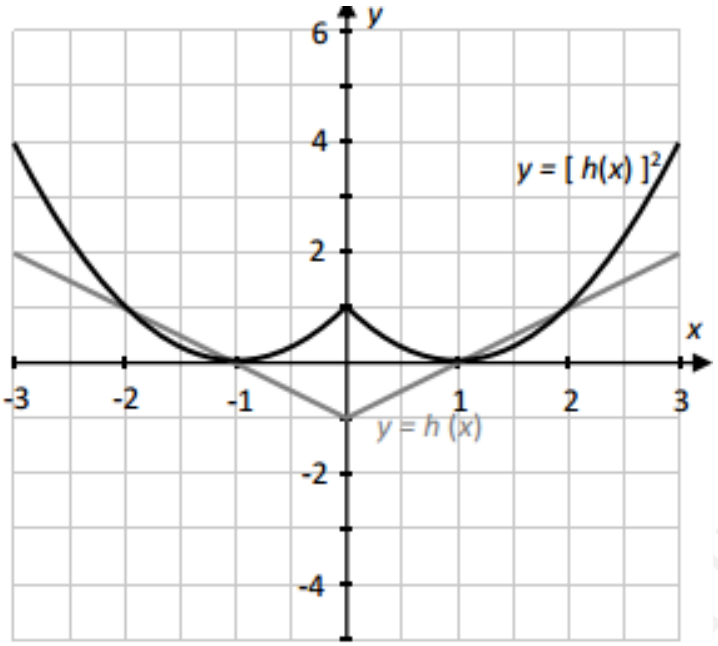


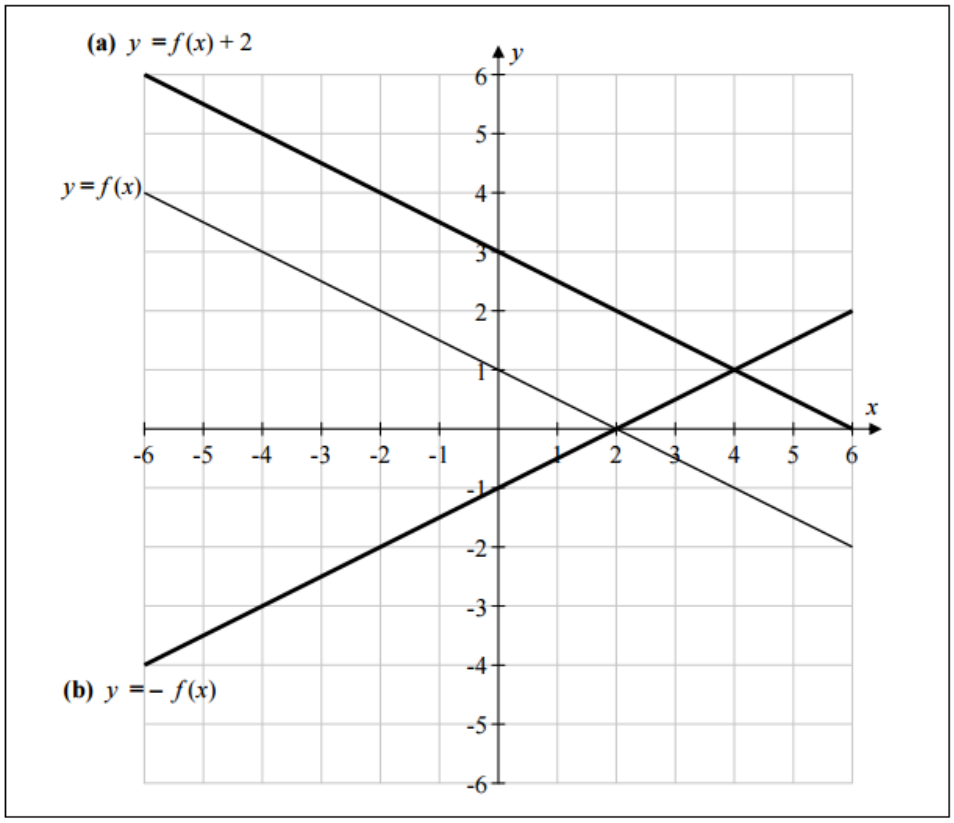
(b) i. .

x	−3	−2	−1	0	1	2	3
$h(x)$	2	1	0	−1	0	1	2

ii. .

10.





6

1. (a) $h = 3 \quad h = 5$ (b)$n = 40$ (c) 180
   (d) (i) $b + c = 3 \quad 2b + c = 5$ (ii) $b = 2 \quad c = 1$