

# Revision Sheet Solutions

Q1

a)  $f(x) = 4x - 5$

i)  $f(2) = 4(2) - 5$   
 $= 8 - 5$   
 $= \boxed{3}$

ii)  $f(-3) = 4(-3) - 5$   
 $= -12 - 5$   
 $= \boxed{-17}$

iii)  $f(0) = 4(0) - 5$   
 $= 0 - 5$   
 $= \boxed{-5}$

iv)  $f(x) = 23$

$\Rightarrow 4x - 5 = 23$

$4x = 23 + 5$

$4x = 28$

$\boxed{x = 7}$

v)  $f(x) = -29$

$\Rightarrow 4x - 5 = -29$

$4x = -29 + 5$

$4x = -24$

$\boxed{x = -6}$

b)  $g(x) = 2x^2 - 3x + 5$

i)  $g(3) = 2(3)^2 - 3(3) + 5$   
 $= 18 - 9 + 5$   
 $= \boxed{14}$

ii)  $g(-2) = 2(-2)^2 - 3(-2) + 5$   
 $= 8 + 6 + 5$   
 $= \boxed{19}$

iii)  $g\left(\frac{1}{2}\right) = 2\left(\frac{1}{2}\right)^2 - 3\left(\frac{1}{2}\right) + 5$   
 $= \frac{1}{2} - \frac{3}{2} + 5$   
 $= \boxed{4}$

Q2

a)  $f(x) = 3x - 2 \quad -2 \leq x \leq 3$

i)  $f(-2) = 3(-2) - 2 = -8$

$f(-1) = 3(-1) - 2 = -5$

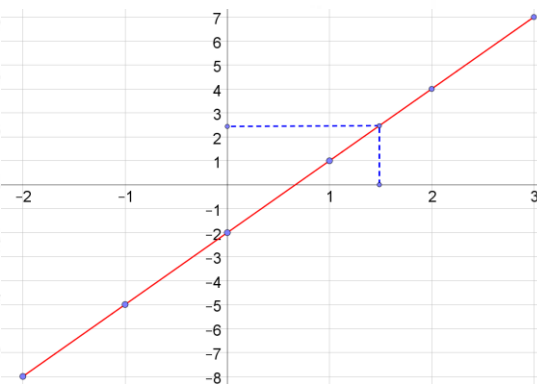
$f(0) = 3(0) - 2 = -2$

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

$f(2) = 3(2) - 2 = 4$

$f(3) = 3(3) - 2 = 7$

ii) From graph:  $f(1.5) = 2.5$



b)

i)  $g(x) = 2x^2 - 3x - 7 \quad -3 \leq x \leq 3$

$g(-2): 2(-2)^2 - 3(-2) - 7 = 7$

$g(-1): 2(-1)^2 - 3(-1) - 7 = -2$

$g(0): 2(0)^2 - 3(0) - 7 = -7$

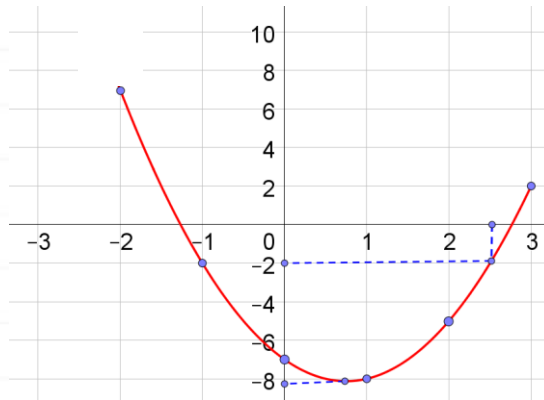
$g(1): 2(1)^2 - 3(1) - 7 = -8$

$g(2): 2(2)^2 - 3(2) - 7 = -5$

$g(3): 2(3)^2 - 3(3) - 7 = 2$

ii) From graph:  $g(2.5) = -2$

iii) From graph: Min value =  $-8.2$



c)

i)  $h(x) = 2x^3 + 3x^2 - 11x - 6 \quad -3 \leq x \leq 2$

$h(-3): 2(-3)^3 + 3(-3)^2 - 11(-3) - 6 = 0$

$h(-2): 2(-2)^3 + 3(-2)^2 - 11(-2) - 6 = 12$

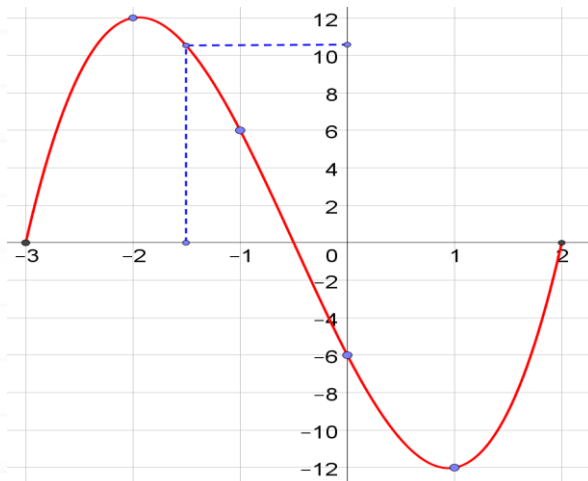
$h(-1): 2(-1)^3 + 3(-1)^2 - 11(-1) - 6 = 6$

$h(0): 2(0)^3 + 3(0)^2 - 11(0) - 6 = -6$

$h(1): 2(1)^3 + 3(1)^2 - 11(1) - 6 = -12$

$h(2): 2(2)^3 + 3(2)^2 - 11(2) - 6 = 0$

ii) From graph:  $h(-1.5) = 10.4$



d)  $f(x) = 3^x \quad -1 \leq x \leq 3$

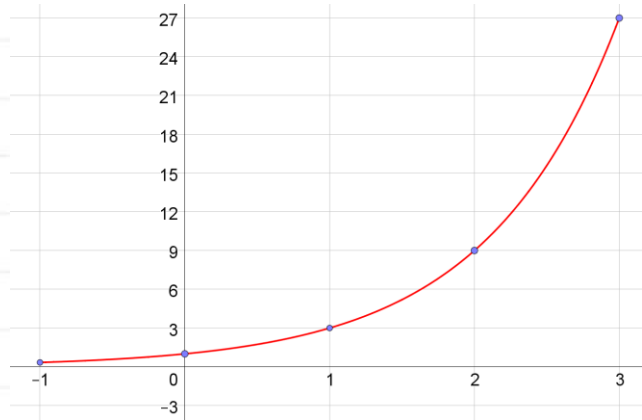
$f(-1): 3^{(-1)} = 0.33$

$f(0): 3^{(0)} = 1$

$f(1): 3^{(1)} = 3$

$f(2): 3^{(2)} = 9$

$f(3): 3^{(3)} = 27$



Q3

i)  $f(x) = x^3 - 3x^2 + 2x + 3$

$g(x) = 5 + 2x - x^2$

$f(-1.5): (-1.5)^3 - 3(-1.5)^2 + 2(-1.5) + 3 = -10$

$g(-1.5): 5 + 2(-1.5) - (-1.5)^2 = -\frac{1}{4}$

$f(-1): (-1)^3 - 3(-1)^2 + 2(-1) + 3 = -3$

$g(-1): 5 + 2(-1) - (-1)^2 = 2$

$f(0): (0)^3 - 3(0)^2 + 2(0) + 3 = 3$

$g(0): 5 + 2(0) - (0)^2 = 5$

$f(1): (1)^3 - 3(1)^2 + 2(1) + 3 = 3$

$g(1): 5 + 2(1) - (1)^2 = 6$

$f(2): (2)^3 - 3(2)^2 + 2(2) + 3 = 3$

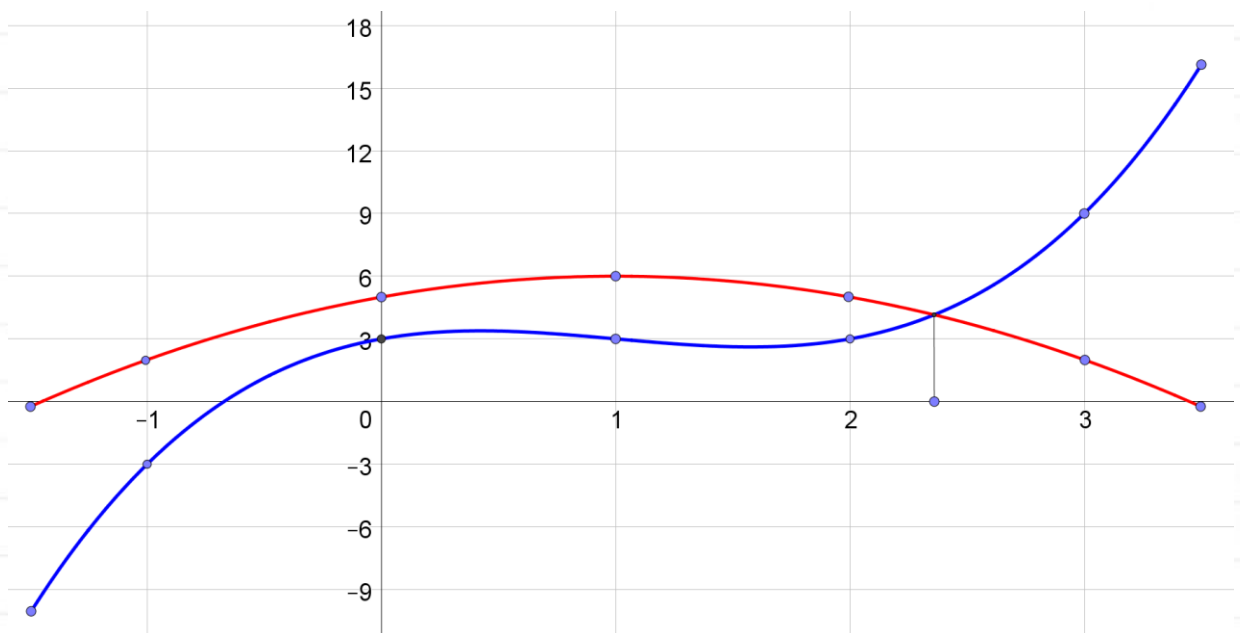
$g(2): 5 + 2(2) - (2)^2 = 5$

$f(3): (3)^3 - 3(3)^2 + 2(3) + 3 = 9$

$g(3): 5 + 2(3) - (3)^2 = 2$

$f(3.5): (3.5)^3 - 3(3.5)^2 + 2(3.5) + 3 = 16$

$g(3.5): 5 + 2(3.5) - (3.5)^2 = -\frac{1}{4}$



ii) From graph:  $f(x) = g(x)$  at  $x = 2.3$

Q4.  $f(x) = 3x - 2$     $g(x) = x^2$     $h(x) = 2 - 4x$

i)  $f \circ g(1)$

$\Rightarrow$  g first

$g(1) = (1)^2 = 1$

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

$= \boxed{1}$

ii)  $h \circ g(4)$

$\Rightarrow$  g first

$g(4) = (4)^2 = 16$

$h(16) = 2 - 4(16)$

$= \boxed{-62}$

iii)  $f \circ h(-2)$

$\Rightarrow$  h first

$h(-2) = 2 - 4(-2) = 10$

$f(10) = 3(10) - 2$

$= \boxed{28}$

### Past Exam Questions

Q5.

a) i)

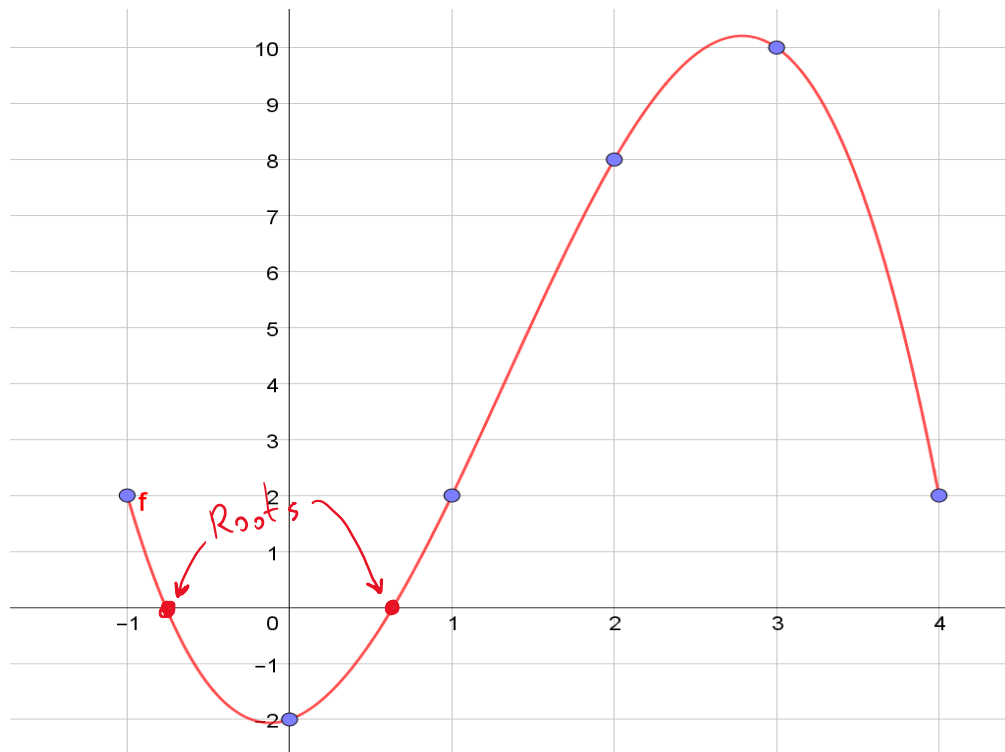
$x$	-1	0	1	2	3	4
$f(x)$	2	-2	2	8	10	2

$f(x) = -x^3 + 4x^2 + x - 2$

$f(-1) = -(-1)^3 + 4(-1)^2 + (-1) - 2$

$= 2$

Repeat for other inputs



ii) Roots are where graph crosses x-axis

$\Rightarrow$  from graph above:  $x = -0.78, x = 0.63$

Q6.  $c(t) = -t^3 + 4.5t^2 + 54t$

a) @  $t=4$

$$c(4) = -4^3 + 4.5(4)^2 + 54(4)$$

$$= \boxed{224 \text{ units}}$$

b)

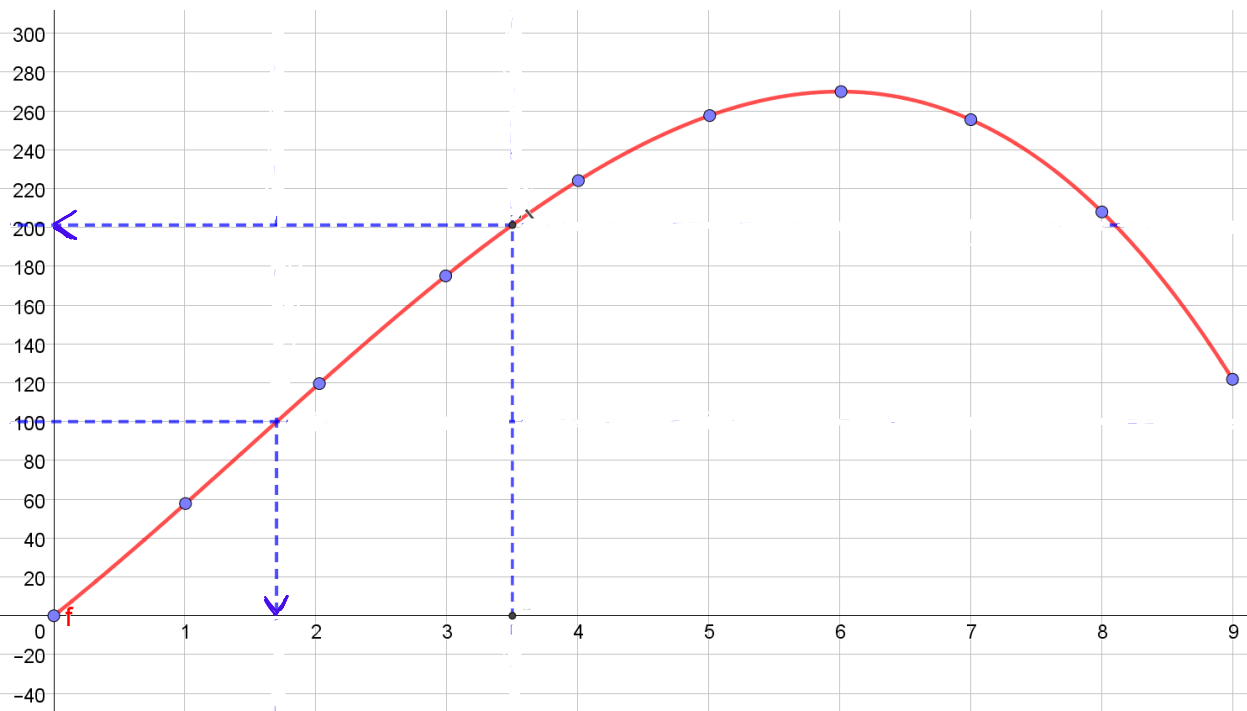
t	0	1	2	3	4	5	6	7	8	9
c(t)	0	57.5	118	175.5	224	257.5	270	255.5	208	121.5

$$c(t) = -t^3 + 4.5t^2 + 54t$$

$$c(2) = -(2)^3 + 4.5(2)^2 + 54(2)$$

$$= 118 \quad \text{Repeat for other inputs}$$

c)



d) i) From graph above:  $\boxed{201 \text{ Units}}$

ii) From graph above:  $\boxed{1.6 \text{ hrs}}$

Q7.

$$P(x) = 275x - x^2 - 2000$$

a) no cable sold  $\Rightarrow x = 0$

$$\Rightarrow P(x) = 275(0) - (0)^2 - 2000$$

$$= -2000$$

$\Rightarrow$  €2000 loss

c) i)

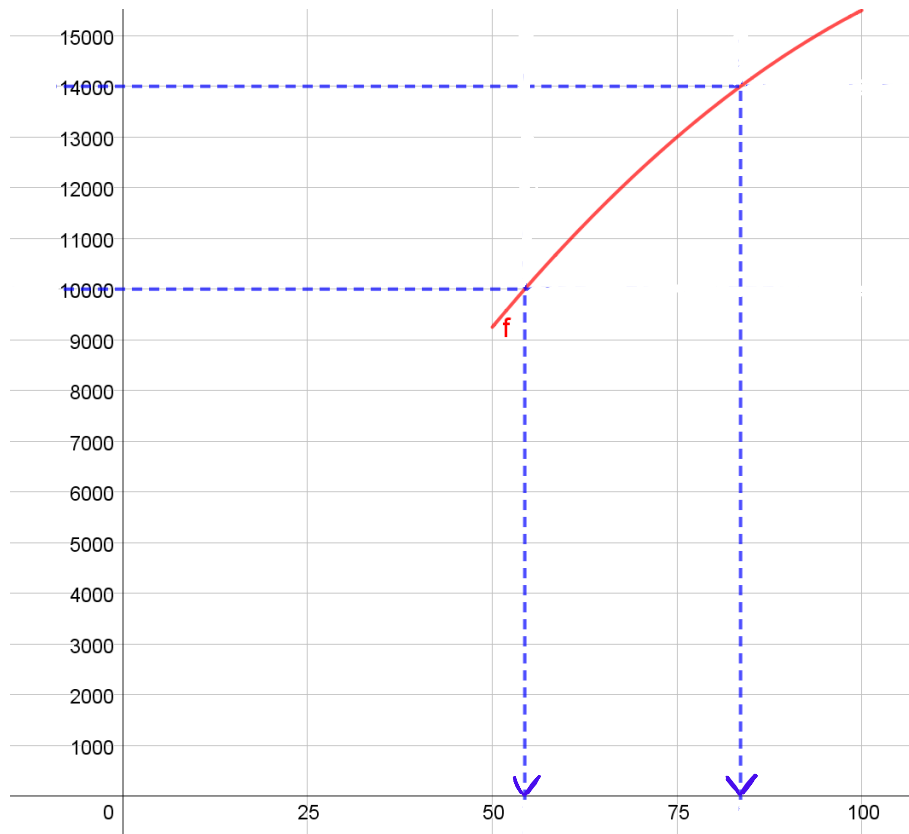
No. of km cable sold	50	60	70	80	90	100
Profit	9250	10900	12350	13600	14650	15500

$$P(x) = 275x - x^2 - 2000$$

$$P(50) = 275(50) - (50)^2 - 2000$$

$$= 9250 \quad \text{Repeat for other inputs}$$

ii)



iii) From graph above they would need to sell between 53 and 82 km of cable roughly.

Q8.  $f(x) = x^3 + x^2 - 2x + 7$

a) Cuts y-axis  $\Rightarrow x = 0$   
 $f(0) = (0)^3 + (0)^2 - 2(0) + 7$   
 $= 7$

$\Rightarrow$  Crosses x-axis @  $(0, 7)$

b)  $(1, 7) \Rightarrow 7 = (1)^3 + (1)^2 - 2(1) + 7$  (Subbing in  $(1, 7)$ )  
 $7 = 1 + 1 - 2 + 7$   
 $7 = 7 \Rightarrow$  Verified

Q9.  $f(x) = 5x - x^2$        $g(x) = x + 3$

Point of intersection of  $f$  and  $g \Rightarrow$  where is  $f(x) = g(x)$ ?

$$f(x) = g(x)$$

$$5x - x^2 = x + 3$$

$$-x^2 + 5x - x - 3 = 0$$

$$-x^2 + 4x - 3 = 0$$

$$x^2 - 4x + 3 = 0$$

$$(x - 3)(x - 1) = 0$$

$$x - 3 = 0 \text{ or } x - 1 = 0$$

$$x = 3$$

$$x = 1$$

If  $x = 3$

$$y = 5(3) - (3)^2$$

$$= 15 - 9$$

$$= 6$$

$$\Rightarrow (3, 6)$$

↑  
B

If  $x = 1$

$$y = 5(1) - (1)^2 \text{ (subbing into } f(x))$$

$$= 5 - 1$$

$$= 4$$

$$\Rightarrow (1, 4)$$

↑  
A