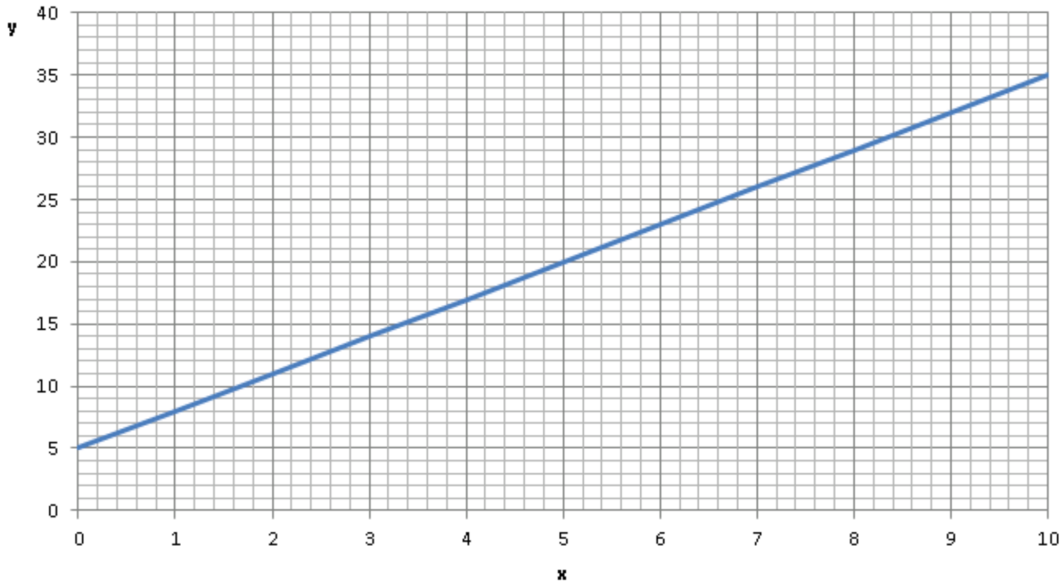
Railway Engineering Mathematics

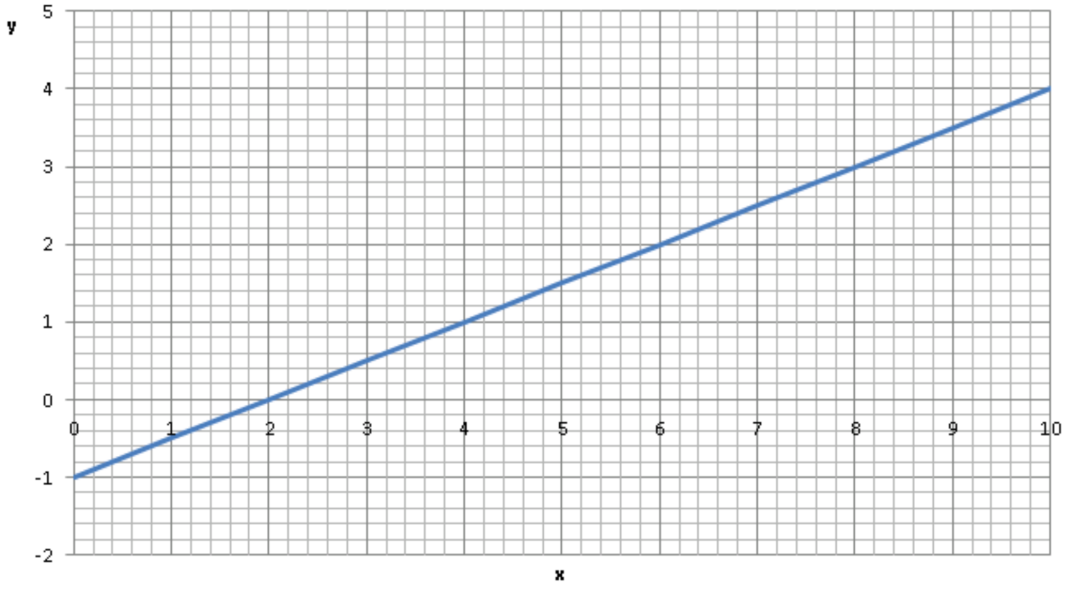
Tutorial Sheet 5

1. Determine the equation of the following graphs:

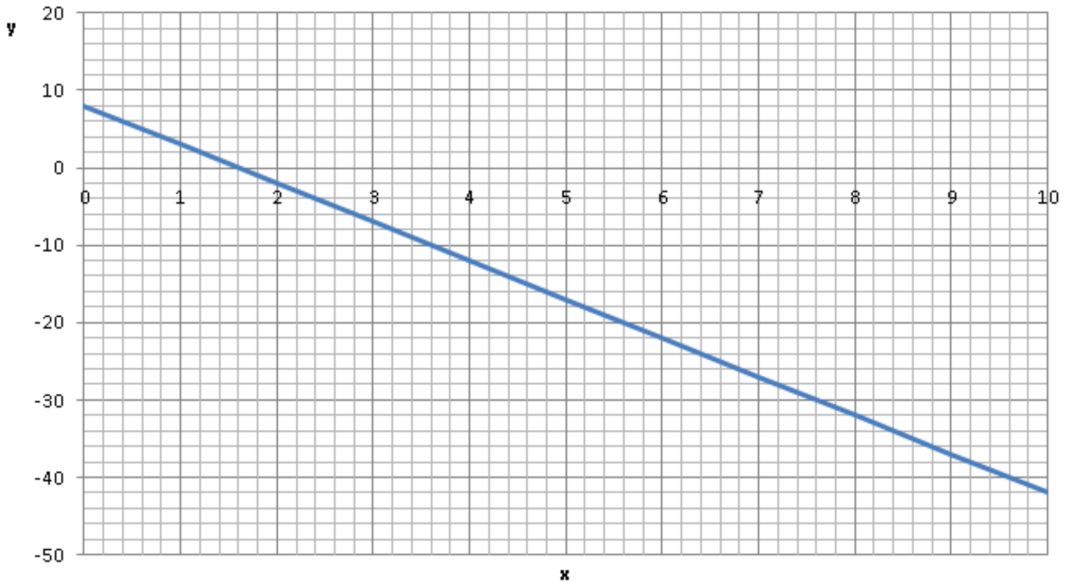
(a)



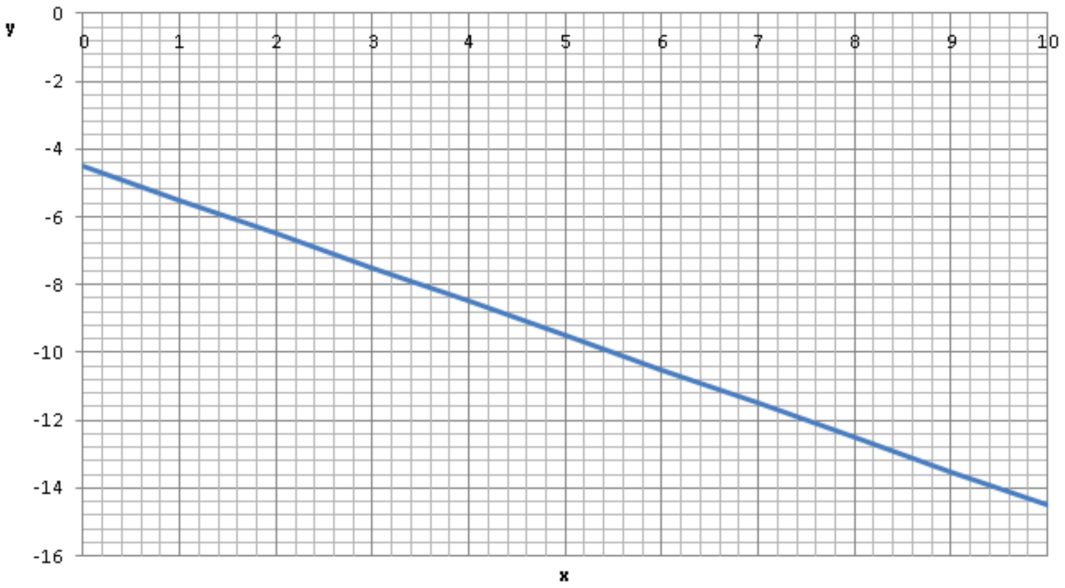
(b)



(c)


y
20
10
0
-10
-20
-30
-40
-50
0
1
2
3
4
5
6
7
8
9
10
x

(d)


y
0
-2
-4
-6
-8
-10
-12
-14
-16
0
1
2
3
4
5
6
7
8
9
10
x

2. Sketch the graph of the the following functions, indicating the points at which the line crosses the x and y axes:

(a) $y = 3x + 2$

(b) $y = 3x - 2$

(c) $y = 3x$

(d) $y = 1 - 2x$

(e) $y = -x + 1$

(f) $y = 1$

(g) $y = 1 + 2x$

3. Using technology (EXCEL or otherwise), plot the following polynomial functions. You may choose your own range of x, unless otherwise stated.

(a) $y = 3x - 9$

(b) $y = -5x + 12$

(c) $y = 7x^2 - 4x + 6$ in the range $-1 \leq x \leq 3$

(d) $y = x^3 - 6x^2 + 8x - 1$ in the range $-1 \leq x \leq 5$

(e) $y = -2x + 6$ and $y = x^2 - 6x - 16$ in the range $-4 \leq x \leq 10$

(Plot both of these functions on the same set of axes.)

4. Determine the equation of the straight line that passes through the points:

(a) $(-2, 9)$ and $(1, -6)$

(b) $(-1, -8)$ and $(3, 4)$

(c) $(3, -13)$ and $(5, -17)$

(d) $(1, 5.5)$ and $(6, 3)$

5. In a market, for a time when demand for a product is high relative to supply (that is, before the market becomes saturated with your product or a similar one manufactured by a competitor), we can roughly approximate the relationship between the profit of our company and the number of units manufactured with a linear model.

   You are a financial analyst in the employ of the *Persimmon* company, which has just developed a new product called the *uPhone*. Public reception has been extremely positive, and market research suggests that most people are very keen to puchase a *uPhone* as soon as possible. However, currently the supply of *uPhones* coming out of your factories is relatively low due to the complex engineering processes and rare metals required in the manufacturing process.

   In the first quarter of this year, the company made and sold 1500 units, and reported a profit of £60,000. In the second quarter, we were able to increase production to 6000 units. All of these were sold and a profit of £960,000 was made.

   (a) How many *uPhones* need to be sold each quarter in order to break even during that financial quarter?

   (b) In the third quarter, supply managers are warning that production may slow to 5000 units. Assuming that public demand for the product remains high, how much profit do you forecast?