

(a) 2020:  $240,000 \times 1.08 = \text{€}259,200$

2019:  $259,200 \times 1.09 = \text{€}282,528$

(b)  $\frac{\text{Increase}}{\text{original value}} \rightarrow \frac{472,000 - 460,000}{460,000} = 0.02608$

$0.02608 \times 100 = 2.6\%$

(c)  $370,000 = 265,000 \left(1 + \frac{r}{100}\right)^4$

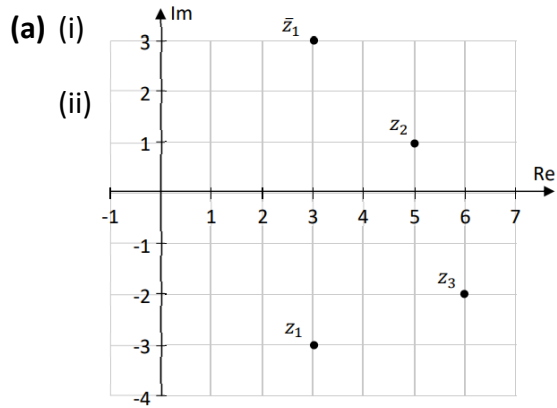
$$\frac{370,000}{265,000} = \left(1 + \frac{r}{100}\right)^4$$

$$1 + \frac{r}{100} = \sqrt[4]{\frac{370}{265}}$$

$$1 + \frac{r}{100} = 1.08702$$

$$\frac{r}{100} = 0.08702$$

$$r = 8.7\%$$



(iii)  $4(5 + i) - 5(6 - 2i)$

$$20 + 4i - 30 + 10i$$

$$-10 + 14i$$

(iv)  $|6 - 2i|$

$$a^2 + b^2 = c^2$$

$$6^2 + (-2)^2 = r^2$$

$$36 + 4 = r^2$$

$$r = \sqrt{40}$$

(b)  $z_5$

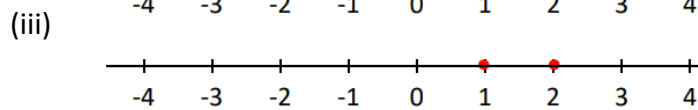
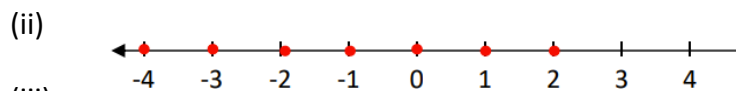
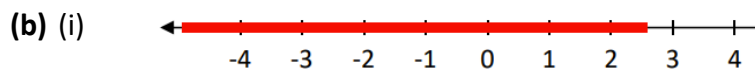
It is the furthest point from the origin

(a)  $3(2x + 4) - 5 = 3$

$$6x + 12 - 5 = 3$$

$$6x = -4$$

$$x = -\frac{2}{3}$$



(c)  $x - y = -1$  (multiply by  $-2$ )

$$2x + 4y = 19$$

$$-2x + 2y = 2$$

$$2x + 4y = 19$$

$$6y = 21$$

$$y = \frac{7}{2}$$

$$x - \frac{7}{2} = -1$$

$$x = \frac{5}{2}$$

$$\left(\frac{5}{2}, \frac{7}{2}\right)$$

(a) (i)  $g(1.5) = 0$

(ii)  $g(x) = -6$  ,  $x = -2.78$

(iii) 1 real root

Reason: only cuts x-axis once

(iv) Local maximum point:  $(-1.6, -1)$

Local minimum point:  $(0.25, -3.1)$

(b) (i)  $h'(x) = 3x^2 + 4x - 1$

(ii)  $h'(2) = 3(2)^2 + 4(2) - 1 = 19$

Equation of the line formula:  $y - y_1 = m(x - x_1)$

Point:  $(2, -6)$

$$y + 6 = 19(x - 2)$$

(a) (i) Cost per metre:  $\frac{12,000}{240} = 50$

$$50 \times 320 = \text{€}16,000$$

(ii)  $6 \times 8 = 48$  total days of work

$$\frac{48}{4} = 12 \quad (4 \text{ people working})$$

12 days

(b) (i)  $\frac{\text{distance}}{\text{speed}} = \text{time}$

$$\frac{120}{180} = \frac{2}{3} \text{ hours}$$

(ii)  $\frac{120}{220} = \frac{6}{11}$

$$\frac{\text{total distance}}{\text{total time}} = \frac{120+120}{\frac{2}{3} + \frac{6}{11}} = 198 \text{ km/hour}$$

(a) (i)  $g(-5) = (-5)^2 + 8(-5) - 6 = -21$

(ii)  $g'(x) = 2x + 8$

$$2x + 8 = 0$$

$$2x = -8$$

$$x = -4$$

(b)  $(2x - 4)(2x - 4) - 6$

$$4x^2 - 8x - 8x + 16 - 6$$

$$4x^2 - 16x + 10$$

(c)  $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$a = 9, b = 6, c = -5$$

$$\frac{-6 \pm \sqrt{(6)^2 - 4(9)(-5)}}{2(9)}$$

$$x = 0.48, x = -1.15$$

(a) (i)  $C = \frac{1,000}{15+10} = 40$

(ii)  $C$  decreases

Justification: Because the denominator is getting bigger relative to the numerator

(iii)  $C = \frac{1,000}{S+10}$

$$(S + 10)C = 1,000$$

$$S + 10 = \frac{1,000}{c}$$

$$S = \frac{1,000}{c} - 10$$

(iv)  $S = \frac{1,000}{30} - 10 = 23.3$        $S = \frac{1,000}{100} - 10 = 0$

$S$  ranges from 0 to 23.3

(b) (i)  $P(0): 0.3 + 0.02(0) = 0.3$

$$P(24): 0.3 + 0.02(24) = 0.78$$

(ii)  $P'(t) = 0.02$

Meaning: This means that the probability that it is raining in Waterville is increasing at a rate of 2% every hour.

(iii)  $0.3 + 0.02(t) = 0.35$

$$0.02t = 0.05$$

$$t = 2.5$$

One hour later:  $t = 3.5$

$$P(3.5) = 0.3 + 0.02(3.5) = 0.37$$

(a)  $50 \times 30 = 1,500 \text{ m}^2$

(b)  $\text{Area} = \frac{3}{2}(0 + 2 + 2(10 + 14 + 12 + 10 + 8)) = 165 \text{ m}^2$

(c) Make more divisions

(d)  $1,500 - 172 = 1,328$

$$1,328 \times 2.55 = \text{€}3,386.4$$

$$\text{€}3,390$$

(e)  $\text{€}840 = 1.169x$

$$x = \frac{840}{1.169} = \text{€}718.56$$

(f)  $\frac{\text{€}840}{0.8547} \times 1.025 = \text{€}1,007.37$

(a) (i) 1,500

$$(ii) \frac{\text{error}}{\text{actual number of new cases}}$$

$$\frac{1,500-1,000}{1,500} \times 100 = 33\%$$

(iii) Day 15 is: 1,500

Day 20 is: 3,000

(iv) Day 25 is: 6,000

Day 30 is: 12,000

Day 35 is: 24,000

Day 40 is: 48,000

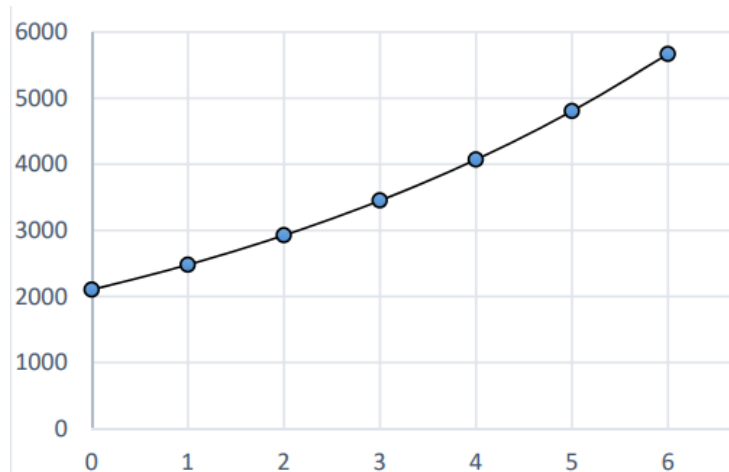
Day 45 is: 96,000

Day 46 is: > 100,000

(b) (i)

$t$	0	1	2	3	4	5	6
$C(t)$	2100	2478	2924	3450	4071	4804	5669

(ii)



(iii)  $21,309 = a(0.83)^{14}$

$$\frac{21,309}{0.83^{14}} = 289,380.8421$$

$$2.89 \times 10^5$$

(a) (i) Radius: 9 mm

$$\pi r^2 h \rightarrow \pi(9)^2(5) = 1,272 \text{ mm}^3$$

(ii)  $\pi r^2 h \rightarrow \pi(7)^2(5)$

$$1,272 - \pi(7)^2(5) = 502 \text{ mm}^3$$

(b) (i)  $\frac{3}{8} \times 100 = 37.5\%$

(ii)  $\frac{15}{15+4+1} \times 25 = 18.75 \text{ g}$

(iii)  $7,500 : 2,225 : 275$

$$300 : 89 : 11$$

(c) (i)  $1\% \text{ of } 1,000 = \text{€}10$

$$2\% \text{ of } 800 = \text{€}16$$

$$\text{€}26$$

(ii)  $\text{€}142.80 - \text{€}10 = \text{€}132.80$

$$\frac{132.80}{0.02} = \text{€}6,640$$

$$6,640 + 1,000 = \text{€}7,640$$

(iii)  $17,500 - 1,000 - 9,000 = 7,500$

$$9,000 \times 2\% = 180$$

$$435 - 10 - 180 = 245$$

$$\frac{245}{r} = 7,500$$

$$r = \frac{245}{7,500} = 0.033$$

$$r = 3.3\%$$