

$$15. (a) (x^2)^{5-r} = x^{10-2r}$$

$$(b) (a^{4+2r})(a^{-3r-5}) = a^{4+2r-3r-5} = a^{-r-1} = \frac{1}{a^{r+1}}$$

$$(c) (b^{2m+3n}) \div (b^{m-n}) = b^{2m+3n-(m-n)} = b^{m+4n}$$

$$(d) x^{3(7-r)} x^r = x^{21-3r+r} = x^{-2r+21}$$

$$(e) (a^{10-p}) \left(\frac{1}{a}\right)^p = a^{10-p-p} = a^{10-2p}$$

$$(f) \left[(3x^4)^{6-m}\right] \left(\frac{1}{x}\right)^m = 3^{6-m} x^{24-4m-m} = 3^{(6-m)} x^{(24-5m)}$$

$$16. (a) (3x^3)^2 = 9x^6$$

$$(b) (4x^2 y^{-4})^{-2} = (4)^{-2} (x^2)^{-2} (y^{-4})^{-2} = \frac{y^8}{16x^4}$$

$$(c) (16x^{10} y^4)^{\frac{1}{2}} = 4x^5 y^2$$

$$(d) (2x^{-2})^2 (3x^4)^{-3} = \left(\frac{4}{x^4}\right) \left(\frac{1}{27x^{12}}\right) = \frac{4}{27x^{16}}$$

$$(e) \frac{(2x^{-1})^{-2}}{2(y^{-1})^{-2}} = \frac{2^{-2} x^2}{2y^2} = \frac{x^2}{8y^2}$$

$$(f) \left(\frac{3x^2}{y^{-1}}\right)^{-2} \left(\frac{2y^2}{3x}\right)^3 = \left(\frac{y^{-2}}{9x^4}\right) \left(\frac{8y^6}{27x^3}\right) = \frac{8y^4}{243x^7}$$

$$17. \left(\frac{3x^3}{2y^4}\right)^2 \left(\frac{2y^2}{3x^4}\right)^{-3} = \left(\frac{9x^6}{4y^8}\right) \left(\frac{27x^{12}}{8y^6}\right) = \frac{243x^{18}}{32y^{14}}$$

$$18. (a)$$

$$x^3 = 27$$

$$x = 27^{\frac{1}{3}}$$

$$x = 3$$

$$(b)$$

$$x^{\frac{1}{2}} = 5$$

$$\left(x^{\frac{1}{2}}\right)^2 = 5^2$$

$$x = 25$$

$$(c)$$

$$c^{\frac{2}{3}} = 64$$

$$\left(c^{\frac{2}{3}}\right)^{\frac{3}{2}} = 64^{\frac{3}{2}}$$

$$c = 8^3$$

$$c = 512$$

$$(d)$$

$$3a^{\frac{4}{5}} = 48$$

$$a^{\frac{4}{5}} = 16$$

$$\left(a^{\frac{4}{5}}\right)^{\frac{5}{4}} = 16^{\frac{5}{4}}$$

$$a = (2^4)^{\frac{5}{4}}$$

$$a = 2^5$$

$$a = 32$$

$$19. (a)$$

$$\left(\frac{1}{16}\right)^{\frac{1}{4}} - \sqrt[3]{\frac{8}{27}} = \sqrt{x^2}$$

$$\frac{1}{2} - \frac{2}{3} = x$$

$$x = \frac{3}{6} - \frac{4}{6}$$

$$x = \frac{-1}{6}$$

$$(b)$$

$$\sqrt[3]{\frac{1}{8}} - \sqrt[4]{x^4} + 15 = \sqrt[4]{16}$$

$$\frac{1}{2} - x + 15 = 2$$

$$x = \frac{1}{2} + 13$$

$$x = \frac{27}{2}$$

$$20. A: \frac{a^{-2b} a^{-b+2}}{(a^{-2})^b} = a^{-2b-b+2+2b} = a^{-b+2} = 2^3 = 8$$

$$B: \frac{(a^b)^{-3} a^{-(1-2b)}}{(a^{-b})^3} = a^{-3b-1+2b+3b} = a^{2b-1} = 2^{-3} = \frac{1}{8}$$

$\therefore$ A has the greater value.

Practise, Apply, Solve 1.11, page 94

$$1. (a) 27 = 3^3$$

$$(b) 81 = 3^4$$

$$(c) \frac{1}{9} = 3^{-2}$$

$$(d) 9^{2x} = (3^2)^{2x} = 3^{4x}$$

$$(e) \left(\frac{1}{27}\right)^x = \left(\frac{1}{3}\right)^{3x} = 3^{-3x}$$

$$2. (a) 3^{2x-5} = 27$$

$$(i) \text{ For } x = 1: 3^{2(1)-5} = 3^{-3} = \frac{1}{27} \neq 27$$

$$(ii) \text{ For } x = 4: 3^{2(4)-5} = 3^3 = 27$$

$\therefore x = 4$ is the solution.

(b) $4^{x+3} = 64$

(i) For $x = 1$: $4^{1+3} = 4^4 = 256 \neq 64$

(ii) For $x = 0$: $4^{0+3} = 4^3 = 64$

$\therefore x = 0$ is the solution.

(c) $5^{x+2} = \frac{1}{25}$

(i) For $x = 0$: $5^{0+2} = 5^2 = 25 \neq \frac{1}{25}$

(ii) For $x = -4$: $5^{-4+2} = 5^{-2} = \frac{1}{25}$

$\therefore x = -4$ is the solution.

(d) $2^{5x+2} = \sqrt{2}$

(i) For $x = \frac{-3}{10}$: $2^{5\left(\frac{-3}{10}\right)+2} = 2^{\frac{1}{2}} = \sqrt{2}$

$\therefore x = \frac{-3}{10}$ is the solution.

3. (a)

$2^x = 2^7$

$x = 7$

(b)

$5^x = 5^3$

$x = 3$

(c)

$3^{x+6} = 3^{12}$

$x + 6 = 12$

$x = 6$

(d)

$10^{2x-1} = 10^3$

$2x - 1 = 3$

$x = 2$

(e)

$2^{2x-1} = 2^{x+9}$

$2x - 1 = x + 9$

$x = 10$

(f)

$7^{3x+2} = 7^{2x+5}$

$3x + 2 = 2x + 5$

$x = 3$

(g)

$4^{2x} = 4^8$

$2x = 8$

$x = 4$

(h)

$5^x = 5^{3x-12}$

$x = 3x - 12$

$x = 6$

4. (a)

$2^x = 32$

$2^x = 2^5$

$x = 5$

(b)

$3^x = 27$

$3^x = 3^3$

$x = 3$

(c)

$3^x = 9^{x-1}$

$3^x = (3^2)^{x-1}$

$3^x = 3^{2x-2}$

$x = 2x - 2$

$x = 2$

(d)

$5^x = 3125$

$5^x = 5^5$

$x = 5$

(e)

$4(2^x) = 32$

$2^x = 8$

$2^x = 2^3$

$x = 3$

(f)

$5^x = \frac{1}{125}$

$5^x = 5^{-3}$

$x = -3$

(g)

$6^x = \sqrt[3]{6}$

$6^x = 6^{\frac{1}{3}}$

$x = \frac{1}{3}$

(h)

$3^{-x} = \frac{1}{81}$

$3^{-x} = 3^{-4}$

$x = 4$

5. (a)

$2^x = 20$

$x \doteq 4.32$

(b)

$5^x = 35$

$x \doteq 2.21$

(c)

$3^x = 100$

$x \doteq 4.19$

(d)

$10^x = 800$

$x \doteq 2.90$

(e)

$$2^{2x} = 50$$

$$2x \doteq 5.64$$

$$x \doteq 2.82$$

(f)

$$7^{3x} = 150$$

$$3x \doteq 2.58$$

$$x \doteq 0.86$$

(g)

$$4^{2x-1} = 80$$

$$2x - 1 \doteq 3.16$$

$$x \doteq 2.08$$

(h)

$$200 = 5^{3x+2}$$

$$3x + 2 \doteq 3.29$$

$$x \doteq 0.43$$

6. (a)

$$4^x = 8\sqrt{2}$$

$$2^{2x} = 2^{3+\frac{1}{2}}$$

$$2^{2x} = 2^{\frac{7}{2}}$$

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

$$x = \frac{7}{4}$$

(b)

$$3^x = \sqrt[5]{9}$$

$$3^x = 3^{\frac{2}{5}}$$

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

(c)

$$125^x = 25\sqrt{5}$$

$$5^{3x} = 5^{2+\frac{1}{2}}$$

$$5^{3x} = 5^{\frac{5}{2}}$$

$$3x = \frac{5}{2}$$

$$x = \frac{5}{6}$$

(d)

$$8^x = 16\sqrt[3]{2}$$

$$(2^3)^x = (2^4)2^{\frac{1}{3}}$$

$$2^{3x} = 2^{4+\frac{1}{3}}$$

$$3x = \frac{13}{3}$$

$$x = \frac{13}{9}$$

$$x = 1\frac{4}{9}$$

7. (a)

$$\left(\frac{1}{9}\right)^{x+2} = \left(\frac{1}{27}\right)^{x+3}$$

$$\left(\frac{1}{3}\right)^{2x+4} = \left(\frac{1}{3}\right)^{3x+9}$$

$$2x + 4 = 3x + 9$$

$$x = -5$$

(b)

$$\mathbf{LS} = \left(\frac{1}{9}\right)^{-5+2} \quad \mathbf{RS} = \left(\frac{1}{27}\right)^{-5+3}$$

$$= (9^{-1})^{-3} = (27^{-1})^{-2}$$

$$= 9^3 = 27^2$$

$$= 729 = 729$$

$\therefore$ LS = RS, so the solution is verified.

8. (a)

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

$$2^{7-x} = 2^{-1}$$

$$7 - x = -1$$

$$x = 8$$

(b)

$$2^{x-2} = 4^{x+2}$$

$$2^{x-2} = 2^{2x+4}$$

$$x - 2 = 2x + 4$$

$$x = -6$$

(c)

$$\left(\frac{1}{4}\right)^{x-2} = \left(\frac{1}{8}\right)^{x+1}$$

$$(2^{-2})^{x-2} = (2^{-3})^{x+1}$$

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

$$x = -7$$

(d)

$$9^{2x+1} = 81(27^x)$$

$$3^{4x+2} = (3^4)(3^{3x})$$

$$3^{4x+2} = 3^{3x+4}$$

$$4x + 2 = 3x + 4$$

$$x = 2$$

(e)

$$2^{2x+2} + 7 = 71$$

$$2^{2x+2} = 64$$

$$2^{2x+2} = 2^6$$

$$2x + 2 = 6$$

$$x = 2$$

(f)

$$(2^{x+1})(4^{x+1})(8^{x+1}) = 128^x$$

$$2^{x+1}2^{2x+2}2^{3x+3} = 2^{7x}$$

$$6x + 6 = 7x$$

$$x = 6$$

9. (a)

$$2^{x^2} = 32(2^{4x})$$

$$2^{x^2} = 2^5 2^{4x}$$

$$2^{x^2} = 2^{4x+5}$$

$$x^2 = 4x + 5$$

$$x^2 - 4x - 5 = 0$$

$$(x - 5)(x + 1) = 0$$

$$x = 5, x = -1$$

(b)

$$3^{x^2} = 27(3^{2x})$$

$$3^{x^2} = 3^{2x+3}$$

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

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

$$x = 3, x = -1$$

(c)

$$9^{x+2} = \left(\frac{1}{27}\right)^{x+2}$$

$$3^{2x+4} = 3^{-3x-6}$$

$$2x + 4 = -3x - 6$$

$$5x = -10$$

$$x = -2$$

(d)

$$2^{r^2+6r} = 2^{-8}$$

$$r^2 + 6r + 8 = 0$$

$$(r + 2)(r + 4) = 0$$

$$r = -2, r = -4$$

(e)

$$3^{x^2+20} = \left(\frac{1}{27}\right)^{3x}$$

$$3^{x^2+20} = 3^{-9x}$$

$$x^2 + 9x + 20 = 0$$

$$(x + 5)(x + 4) = 0$$

$$x = -5, x = -4$$

(f)

$$8^{x^2} = 4^{4-5x}$$

$$2^{3x^2} = 2^{8-10x}$$

$$3x^2 + 10x - 8 = 0$$

$$3x^2 + 12x - 2x - 8 = 0$$

$$3x(x + 4) - 2(x + 4) = 0$$

$$(3x - 2)(x + 4) = 0$$

$$x = \frac{2}{3}, x = -4$$

(g)

$$(2^{x-4})^x = 32$$

$$2^{x^2-4x} = 2^5$$

$$x^2 - 4x - 5 = 0$$

$$(x - 5)(x + 1) = 0$$

$$x = 5, x = -1$$

(h)

$$9^{x^2+1} = (27)^x(3^{2x})$$

$$3^{2x^2+2} = 3^{3x+2x}$$

$$2x^2 + 2 = 5x$$

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

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

$$2x(x - 2) - (x - 2) = 0$$

$$(2x - 1)(x - 2) = 0$$

$$x = \frac{1}{2}, x = 2$$

(i)

$$2^{x^2} = (16^{x-1})(2^x)$$

$$2^{x^2} = 2^{4x-4+x}$$

$$2^{x^2} = 2^{5x-4}$$

$$x^2 - 5x + 4 = 0$$

$$(x - 1)(x - 4) = 0$$

$$x = 1, x = 4$$

10. (a) 2, 6, 18, ..., 39 366

$$t_n = 2(3)^{n-1}$$

$$39\,366 = 2(3)^{n-1}$$

$$19\,683 = 3^{n-1}$$

$$3^9 = 3^{n-1}$$

$$n = 10$$

(b) 5, 10, 20, ..., 10240

$$t_n = 5(2)^{n-1}$$

$$10\,240 = 5(2)^{n-1}$$

$$2048 = 2^{n-1}$$

$$2^{11} = 2^{n-1}$$

$$n = 12$$

(c) -2, -10, -50, ..., -6250

$$t_n = -2(5)^{n-1}$$

$$-6250 = -2(5)^{n-1}$$

$$3125 = 5^{n-1}$$

$$5^5 = 5^{n-1}$$

$$n = 6$$

(d) 16, 8, 4, ..., $\frac{1}{64}$

$$t_n = (16)2^{-1(n-1)}$$

$$t_n = (2^4)2^{1-n}$$

$$t_n = 2^{5-n}$$

$$2^{-6} = 2^{5-n}$$

$$n = 11$$

(e) 3, 6, 12, ..., 384

$$t_n = 3(2)^{n-1}$$

$$384 = 3(2)^{n-1}$$

$$128 = 2^{n-1}$$

$$2^7 = 2^{n-1}$$

$$n = 8$$

(f) 4, 24, 144, ..., 186 624

$$t_n = 4(6)^{n-1}$$

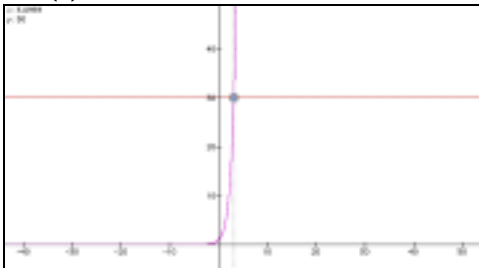
$$186\,624 = 4(6)^{n-1}$$

$$46\,656 = 6^{n-1}$$

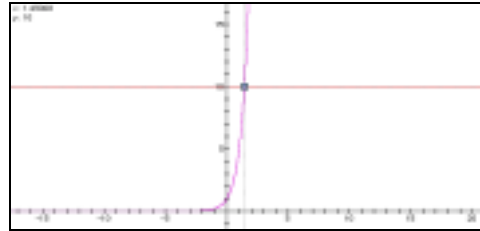
$$6^6 = 6^{n-1}$$

$$n = 7$$

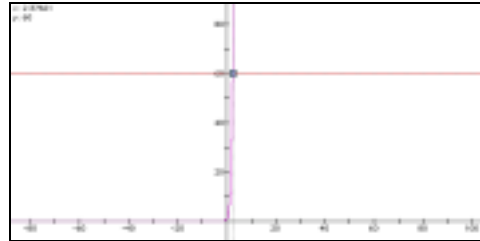
11. (a) $3^x = 30$, $x \doteq 3.10$



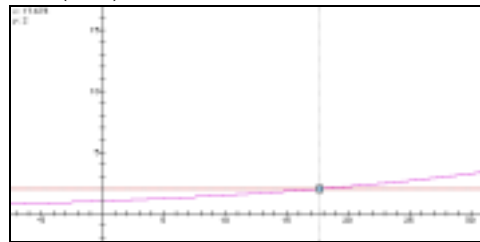
(b) $5^z = 10$, $z \doteq 1.43$



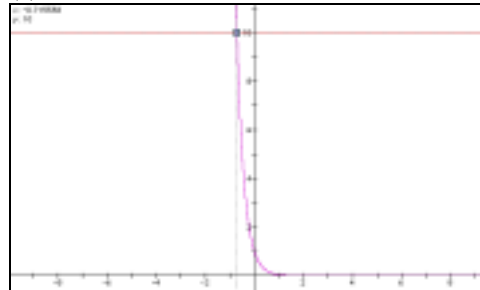
(c) $5.6^y = 60$, $y \doteq 2.38$



(d) $(1.04)^x = 2$, $x \doteq 17.67$



(e) $25^{-x} = 10$, $x \doteq -0.72$

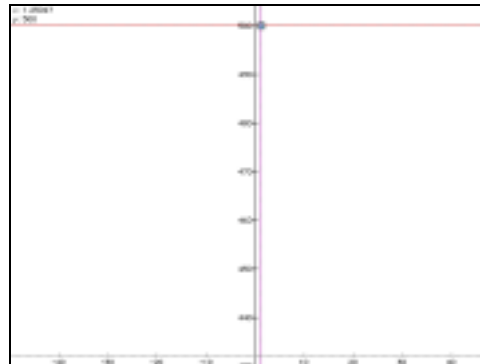


(f)

$$12^{2x} = 500$$

$$2x \doteq 2.501$$

$$x \doteq 1.25$$

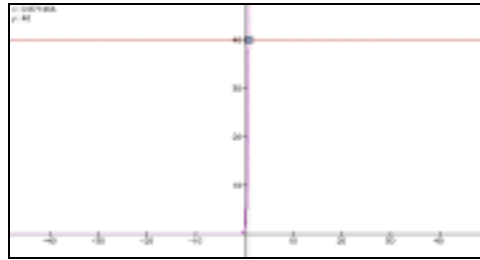


(g)

$$4.1^{3x} = 40$$

$$3x \doteq 2.61$$

$$x \doteq 0.87$$



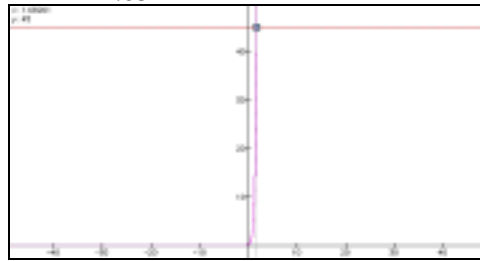
(h)

$$5^{2x-1} = 45$$

$$2x - 1 \doteq 2.36$$

$$2x \doteq 3.36$$

$$x \doteq 1.68$$



12.

$$t_n = 20(2)^{\frac{n}{15}}$$

$$163\,840 = 20(2)^{\frac{n}{15}}$$

$$8192 = 2^{\frac{n}{15}}$$

$$2^{13} = 2^{\frac{n}{15}}$$

$$195 \text{ min} = n$$

$\therefore$ it will take 195 min for the culture to grow to 163 840.

13.

$$9^{2x+1} = 81(27)^x$$

$$(3^2)^{2x+1} = (3^4)(3^3)^x$$

$$3^{4x+2} = 3^{4+3x}$$

$$x = 2$$

$$14. y = 6.489(1.580)^x = 6.489(1.580)^{t-1980}$$

$$(a) \text{ In } 1980, y = 6.489(1.580)^0 = 6.489 \text{ GW}\cdot\text{h}$$

$$(b) \text{ In } 1992, y = 6.489(1.580)^{1992-1980} = 1570.590 \text{ GW}\cdot\text{h}$$

(c)

$$398.191\,107\,2 = 6.489(1.580)^{t-1980}$$

$$61.364\,017\,14 = (1.580)^{t-1980}$$

$$\ln 61.364\,017\,14 = (t - 1980) \ln 1.580$$

$$t = \frac{\ln 61.364\,017\,14}{\ln 1.580} + 1980$$

$$t = 1989$$

$\therefore$ in 1989, 398.1911072 GW·h was produced.

Part 1: Financial Applications of Sequences and Series

(d)

$$500 = 6.489(1.580)^{t-1980}$$

$$77.053\,475\,11 = 1.580^{t-1980}$$

$$\ln 77.053\,475\,11 = (t - 1980) \ln 1.580$$

$$t = \frac{\ln 77.053\,475\,11}{\ln 1.580} + 1980$$

$$t = 1989.50$$

$\therefore$ at the end of June 1989, 500 GW·h was produced.

$$15. i = \frac{0.08}{2} = 0.04$$

$$\$900 = \$500(1.04)^{2n}$$

$$\frac{9}{5} = (1.04)^{2n}$$

$$\ln \frac{9}{5} = (2n) \ln 1.04$$

$$\frac{\ln \frac{9}{5}}{\ln 1.04} = 2n$$

$$n = 7.5 \text{ years}$$

$\therefore$ the deposit will increase to \$900 in 7.5 years.

16. If you can obtain common bases on both sides of the equation, then an algebraic solution should be used.

However, if common bases cannot be obtained, then a graphical solution should be used.

Example #1: The exponential equation $4^{x+2} = 16^{x-1}$ can be solved using an algebraic solution since both 4 and 16 can be written as powers of 2.

$$4^{x+2} = 16^{x-1}$$

$$(2^2)^{x+2} = (2^4)^{x-1}$$

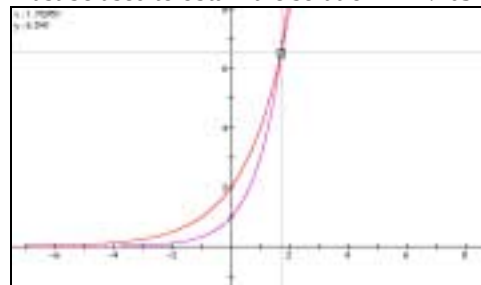
$$2^{2x+4} = 2^{4x-4}$$

$$2x + 4 = 4x - 4$$

$$2x = 8$$

$$x = 4$$

Example #2: The exponential equation $3^x = 2^{x+1}$ cannot be solved using an algebraic solution because common bases cannot be obtained for 3 and 2. Thus, a graphical solution must be used to obtain the solution $x = 1.709\,51$ as shown.



17.

$$10 = 50 \left(\frac{1}{2} \right)^{\frac{t}{18.4}}, \quad t \text{ in days}$$

$$0.2 = \left(\frac{1}{2} \right)^{\frac{t}{18.4}}$$

$$\ln 0.2 = \frac{t}{18.4} \ln \left(\frac{1}{2} \right)$$

$$t = (18.4) \frac{\ln 0.2}{\ln \frac{1}{2}}$$

$$t = 42.72 \text{ days}$$

$\therefore$ it will take 42 days, 17 h, 21 min and 48.4 s to decompose.

18. (a) 5730 years

(b)

$$0.1M_0 = M_0(0.5)^{\frac{t}{5730}}$$

$$\ln 0.1M_0 = \left(\frac{t}{5730} \right) \ln 0.5M_0$$

$$t = (5730) \frac{\ln 0.1M_0}{\ln 0.5M_0}$$

$$t \doteq 19\,034.65 \text{ years}$$

19. $i = \frac{0.09}{12} = 1.0075$

$$2 = (1.0075)^{12t}$$

$$\ln 2 = 12t(\ln 1.0075)$$

$$t = \left(\frac{\ln 2}{\ln 1.0075} \right) \left(\frac{1}{12} \right)$$

$$t \doteq 7.73 \text{ years}$$

$\therefore$ the investment will double in approximately 7.73 years.

20.

$$50\,000 < 32\,000(1.06)^t$$

$$25 < 16(1.06)^t$$

$$1.5625 < (1.06)^t$$

$$\ln 1.5625 < t(\ln 1.06)$$

$$\frac{\ln 1.5625}{\ln 1.06} < t$$

$$t > 7.66 \text{ years}$$

$\therefore$ Erica's annual salary will be more than \$50 000 after approximately 7.66 years.

21.

$$9 < 12(0.92)^t$$

$$0.75 < (0.92)^t$$

$$\ln 0.75 < t(\ln 0.92)$$

$$\frac{\ln 0.75}{\ln 0.92} < t$$

$$t > 3.45 \text{ hours}$$

$\therefore$ the driver has 3.45 hours to turn off the lights in order to still be able to start the car.

22.

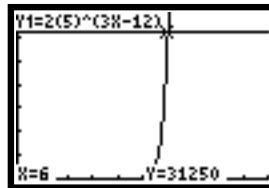
$$31\,250 = 2(5)^{3x-12}$$

$$15\,625 = 5^{3x-12}$$

$$5^6 = 5^{3x-12}$$

$$6 = 3x - 12$$

$$x = 6$$



23 (a) Treat the equation $2^{2x} - 33(2^x) + 32 = 0$ as a quadratic equation. Replace 2^x by x so that the equation now resembles $x^2 - 33x + 32 = 0$.

$$2^{2x} - 33(2^x) + 32 = 0$$

$$(2^x - 1)(2^x - 32) = 0$$

$$x = 0, x = 5$$

(b) Treat the equation $25^x - 30(5^x) + 125 = 0$ as a quadratic equation. Replace 5^x by x so that the equation now resembles $x^2 - 30x + 125 = 0$.

$$25^x - 30(5^x) + 125 = 0$$

$$5^{2x} - 30(5^x) + 125 = 0$$

$$(5^x - 5)(5^x - 25) = 0$$

$$x = 1, x = 2$$

24. (a)

$$9^{x^2-3x} = \frac{1}{27}$$

$$3^{2x^2-6x} = 3^{-3}$$

$$2x^2 - 6x + 3 = 0$$

$$x^2 - 3x + \frac{3}{2} = 0$$

$$\left(x - \frac{3}{2} \right)^2 = \frac{3}{4}$$

$$x = \frac{\pm\sqrt{3} + 3}{2}$$

(b)

$$(5^{x^2})(625) = \left(\frac{1}{125} \right)^{2x}$$

$$(5^{x^2})(5^4) = (5^{-3})^{2x}$$

$$5^{x^2+4} = 5^{-6x}$$

$$x^2 + 6x + 4 = 0$$

$$(x + 3)^2 = 5$$

$$x = \pm\sqrt{5} - 3$$

25. Samantha: $i = \frac{0.06}{4} = 0.015$, Mark: $i = \frac{0.05}{4} = 0.0125$

$$1000(1.015)^{4n} = 1500(1.0125)^{4n}$$

$$\frac{2}{3} = \left(\frac{1.0125}{1.015} \right)^{4n}$$

$$\ln\left(\frac{2}{3}\right) = (4n)\ln\left(\frac{1.0125}{1.015}\right)$$

$$164.416 \div 4n$$

$$n \doteq 41.1 \text{ years}$$

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1. A sequence is an ordered set of numbers. A term is a single element of a sequence. For example, $\{1, 3, 5, 7, \dots\}$ is a sequence, and 5 is the third term.

2. The general term is an expression or formula for all the terms in a sequence. It is a function of a natural number, and using numbers in this formula generates the terms of this sequence.

3. (a) Example: $\{1, 2, 3, \dots, 100\}$

(b) Example: $\{1, 4, 9, 16, \dots\}$

4. (a) $t_n = 4n + 1$, $t_1 = 4(1) + 1 = 5$, $t_2 = 4(2) + 1 = 9$,
 $t_3 = 4(3) + 1 = 13$, $t_4 = 4(4) + 1 = 17$, $t_5 = 4(5) + 1 = 21$

(b) $t_n = 2n^2 - 2n$, $t_1 = 2(1)^2 - 2(1) = 0$, $t_2 = 2(2)^2 - 2(2) = 4$,
 $t_3 = 2(3)^2 - 2(3) = 12$, $t_4 = 2(4)^2 - 2(4) = 24$,
 $t_5 = 2(5)^2 - 2(5) = 40$

(c) $t_n = 3^{n-1}$, $t_1 = 3^{1-1} = 3^0 = 1$, $t_2 = 3^{2-1} = 3^1 = 3$,
 $t_3 = 3^{3-1} = 3^2 = 9$, $t_4 = 3^{4-1} = 3^3 = 27$, $t_5 = 3^{5-1} = 3^4 = 81$

(d) $t_n = -3n + 2$, $t_1 = -3(1) + 2 = -1$, $t_2 = -3(2) + 2 = -4$,
 $t_3 = -3(3) + 2 = -7$, $t_4 = -3(4) + 2 = -10$, $t_5 = -3(5) + 2 = -13$

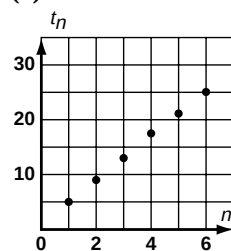
(e) $t_n = (2n + 1)(2n - 1)$, $t_1 = [2(1) + 1][2(1) - 1] = (3)(1) = 3$,
 $t_2 = [2(2) + 1][2(2) - 1] = (5)(3) = 15$,
 $t_3 = [2(3) + 1][2(3) - 1] = (7)(5) = 35$,
 $t_4 = [2(4) + 1][2(4) - 1] = (9)(7) = 63$,
 $t_5 = [2(5) + 1][2(5) - 1] = (11)(9) = 99$

(f) $t_n = \frac{10}{n}$, $t_1 = \frac{10}{1} = 10$, $t_2 = \frac{10}{2} = 5$, $t_3 = \frac{10}{3}$,

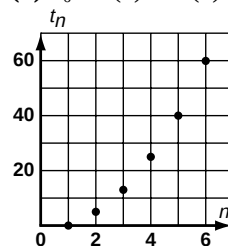
$$t_4 = \frac{10}{4} = \frac{5}{2}, t_5 = \frac{10}{5} = 2$$

5. $t_6 = 4(6) + 1 = 25$

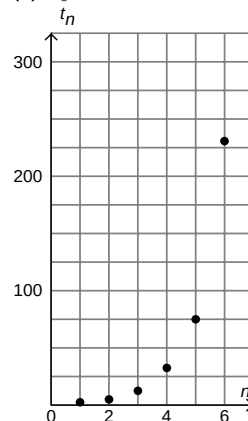
(a)



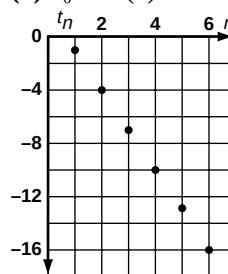
(b) $t_6 = 2(6)^2 - 2(6) = 60$



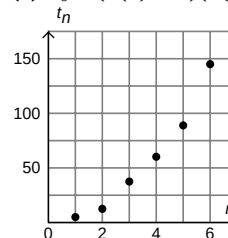
(c) $t_6 = 3^{6-1} = 3^5 = 243$



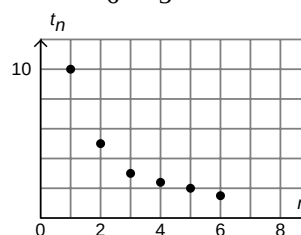
(d) $t_6 = -3(6) + 2 = -16$



(e) $t_6 = (2(6) + 1)(2(6) - 1) = (13)(11) = 143$



(f) $t_6 = \frac{10}{6} = \frac{5}{3}$



6. (a) 2, 7, 12, 17, ...

$$t_n = 2 + (n - 1)(5) = 2 + 5n - 5 = 5n - 3$$

(b) 30, 24, 18, 12, ...

$$t_n = 30 + (n - 1)(-6) = 30 - 6n + 6 = -6n + 36$$

(c) 9, 27, 81, 243, ...

$$t_n = 9(3)^{n-1} = (3^2)(3)^{n-1} = 3^{n+1}$$