A   Test-all Topics

This test, which contains a representative selection of questions on the basic ideas and techniques covered in this resource, attempts to diagnose any weaknesses you may have. Answers, with appropriate references, are given at the end of the test.

1. $4 - 7 - 6 + 5 =$

2. $3 \times (-6) \div (-2) =$

3. $18 \div 6 - 3 =$

4. $2^{-3} - 3^{-2} =$

5. $3x + 5y - 4x =$

6. $2x \times (-3x) =$

7. $-3(x - 1) =$

   (i) $-3x - 1$ (iii) $-3x + 1$ (v) $3x - 1$

   (ii) $-3x - 3$ (iv) $-3x + 3$ (vi) $3x - 3$

8. $3(t - 3) - 2(1 - 2t) =$

9. $\frac{3}{4} + \frac{2}{5} =$

10. 5% of $25 =$

11. Which of the following equations are true?

   (i) $\dfrac{a + b}{a + c} = \dfrac{b}{c}$

   (ii) $\dfrac{ab}{cd} = \dfrac{ba}{cd}$

   (iii) $\dfrac{ab}{bd} = \dfrac{a}{d}$

   (iv) $\dfrac{\frac{a}{b}}{\frac{b}{c}} = \dfrac{a}{c}$

   (v) $\dfrac{\frac{a}{b}}{\frac{c}{b}} = \dfrac{a}{c}$

   (vi) $\dfrac{b - c}{c - b} = -1$

12. $3.09 \div 0.03 =$

    (i) 0.103   (iii) 10.3   (v) 1030

    (ii) 1.03   (iv) 103

13. Evaluate and write as a decimal:

    (i) $3.1 \times 10^4 + 2.7 \times 10^{-2}$

    (ii) $(5.0 \times 10^5) + (2 \times 10^{-3})$

14. $\sqrt{\dfrac{9}{k}} =$

    (i) $\frac{3}{k}$ (iv) $\frac{9}{\sqrt{k}}$

    (ii) $\frac{\sqrt{9}}{\sqrt{k}}$ (v) $\frac{3}{\sqrt{k}}$

    (iii) $\frac{\sqrt{9}}{k}$

15. If $x^3 + 1 = 28$, then $x =$

    (i) 9   (iii) $(29)^{\frac{1}{3}}$ (v) 27

    (ii) 3   (iv) $9^{\frac{2}{3}}$

16. Which of the following are true?

    (i) $7 + 7^2 = 7^3$ (iv) $3^5 \times 2^4 = 6^9$

    (ii) $3^3 \times 3^2 = 9^5$ (v) $5^0 = 0$

    (iii) $(3^5)^2 = 3^{10}$ (vi) $5^7 \div 5^2 = 5^5$

17. $8x^5y^2 \div 4x^2y^3 =$

18. Solve $3 - 2(x - 1) = x + 2$

19. If $4x - 3y = 5$ and $y = 1$, then $x =$

    (i) -2 (iv) $\frac{1}{2}$

    (ii) $-\frac{1}{2}$ (v) $-\frac{1}{3}$

    (iii) 2

20. Solve $\left.\begin{array}{l} 2x + y = 3 \\ x - 2y = 4 \end{array}\right\}$
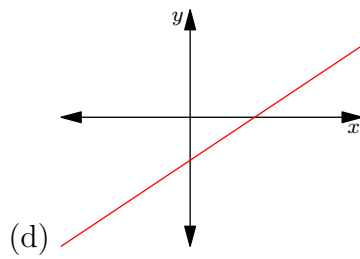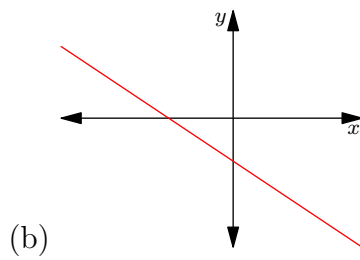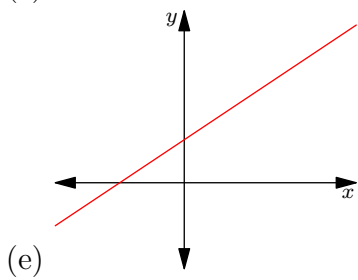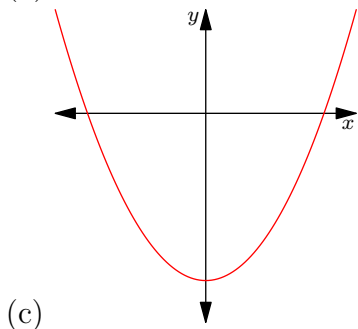
21. Find the gradient of the line $3y = 4x + 2$
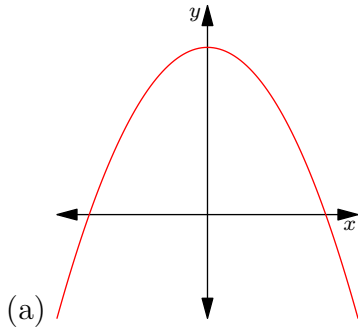
22. Find

    (i) the x-intercept

    (ii) the y-intercept

    of the line $3y = -4x + 2$

23. Which of the graphs **could** be the graph of $2x - 3y = 6$?

(a)

(b)

(c)

(d)

(e)

24. Solve graphically $\left.\begin{array}{l} 2x + y = 3 \\ x - 2y = 4 \end{array}\right\}$

25. $(x+1)(x-2) =$

    (i) $x^2 + 2$ (iii) $x^2 + 3x - 2$

    (ii) $x^2 - 2$ (iv) $x^2 - x - 2$

26. Find the factors of $6x^2 - x - 2$

27. Factorize $4x^2 - 1$

28. If $f(x) = 2x^2 + x - 1$, find the value of

    (i) $f(0)$

    (ii) $f(-1)$

    (iii) $f\left(\frac{1}{2}\right)$

29. Solve $4x^2 - 4x - 3 = 0$

30. Sketch the parabola $y = x^2 - 3x + 2$. Find

    (i) the equation of its axis of symmetry
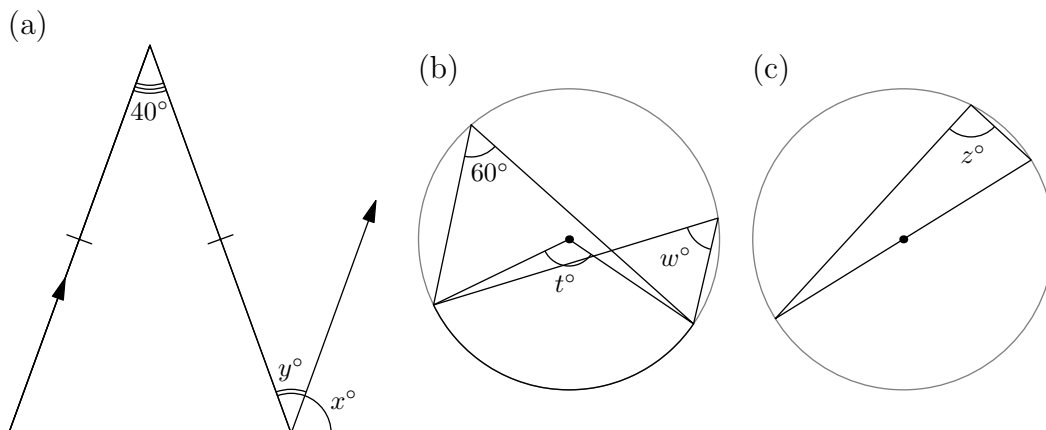
    (ii) the coordinates of its vertex.

31. Rewrite with x alone on the left hand side:
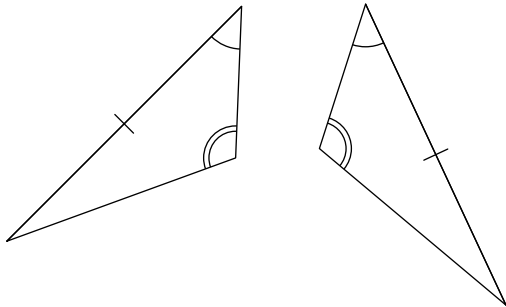
    (i) $2x + 4 < 5x - 2$

    (ii) $-5x > 15$

    (iii) $3(2 - x) < x + 2$

32. Find the sizes of the angles marked:

    (a)

                      (b)   (c)

33. Are the triangles drawn

    (i) congruent

    (ii) similar

    (iii) neither congruent nor similar?

34. $\log 4 + \log 9 =$

    (i) $\log 13$ (iii) $(\log 6)^2$ (v) $\log(4/9)$

    (ii) $2\log 6$ (iv) $5\log 6$

35. Express in radian measure:

    (i) $60°$

    (ii) $15°$

    (iii) $75°$

    (iv) $45°$

36. How high is the tree (measurements in metres)?
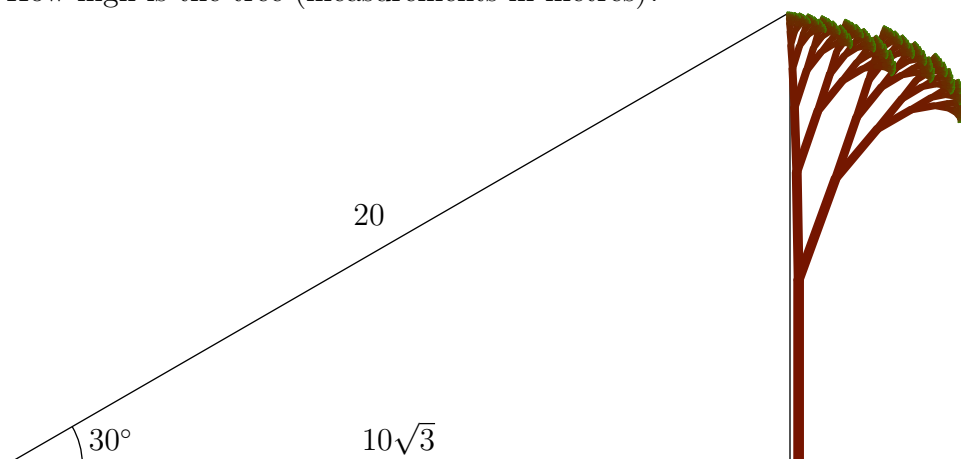
Let $\mathbf{A}, \mathbf{B}$ and $\mathbf{C}$ be the matrices

$$\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & -3 \\ -1 & 0 & 0 \\ 3 & -3 & -1 \end{bmatrix} \qquad \mathbf{B} = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 1 & -3 \\ 3 & 2 & -2 \\ -4 & 0 & -1 \end{bmatrix} \qquad \mathbf{C} = \begin{bmatrix} -3 & -2 & 2 \\ 1 & 3 & 5 \\ -2 & -1 & 0 \\ -1 & -1 & -2 \end{bmatrix}.$$

37. What size are these matrices?

38. Write down the components B_{12}, B_{23} and B_{41}.

39.

$$\mathbf{A} = \begin{bmatrix} 1 & 0 & 3 \\ 2 & -1 & 6 \\ 3 & 1 & 0 \end{bmatrix} \qquad \mathbf{B} = \begin{bmatrix} 0 & -3 & -1 \\ 1 & 2 & 3 \\ -1 & -1 & 0 \end{bmatrix}$$

Calculate $A + B$.

40.

$$\mathbf{A} = \begin{bmatrix} 1 & 1 \\ 2 & 0 \end{bmatrix} \qquad \mathbf{B} = \begin{bmatrix} 0 & 1 \\ 1 & 2 \end{bmatrix}$$

Calculate AB.

41. Find the area of the region bounded by the graph of the parabola $y = x^2$, the x-axis, and the vertical lines $x = 0$ and $x = 1$.

42. Find the anti-derivative of the function $y = \cos(2x)$.

43. What is the average value of the function $y = \sin(x)$ over the interval $0 < x < \pi$?

44. The expression 2^{x+y} equals

   (a) $2^x \times 2^y$
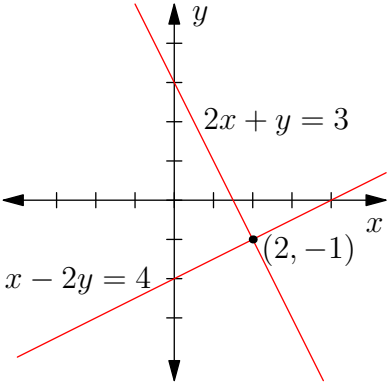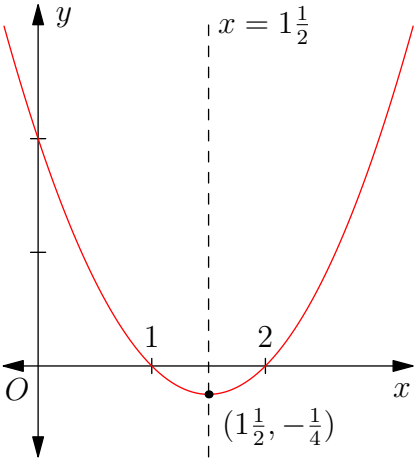
   (b) $2^x + 2^y$

   (c) $y \times 2^x$

45. The derivative of a function $f(x)$ at $x = c$ is

   (a) a maximum of f

   (b) the average rate of change of f

   (c) the slope of the tangent of the graph of f at the point $(c, f(c))$

46. If a die is thrown once, what is the probability of getting an odd number or a four?

47. If a die is rolled twice, what is the probability of both numbers being even?

48. Calculate the median of the following data set: 12, 14, 6, 21, 23, 15, 25, 2, 7, 8.

49. This curve shows a normal distribution. Which of the following statements is **false**?
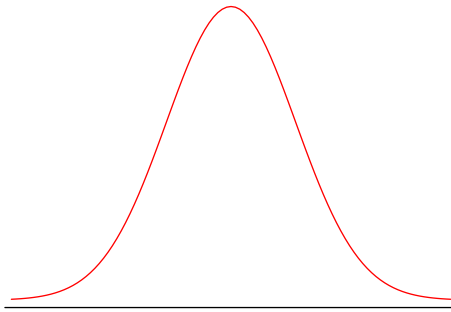
   (a) The mean, median and mode lie on the line of symmetry.

   (b) The number of scores above the median is the same as the number below.

   (c) Scores will most probably lie within two standard deviations from the mean.

   (d) The distribution is skewed.

50. Which of the following is true for these data?
    1, 3, 0, 2, 4, 7, 4

   (a) The mean is 3 and the median is 3.

   (b) The mode is 4 and the median is 2.

   (c) The median is 2 and the mean is 3.

   (d) The mode is 4 and the mean is 3.5.

A.1 Answers to Test-all Questions

Topic	Section	Question	Answer(s)
1	§2	1.	-4
	§3,4,7	2.	9
	§7	3.	0
	§6	4.	$\frac{1}{72}$
2	§2	5.	$-x + 5y$
	§3	6.	$-6x^2$
	§4	7.	(iv)
	§4	8.	$7t - 11$
3	§2	9.	$1\frac{3}{20}$
	§2	10.	$1\frac{1}{4}$
	§3	11.	(ii), (iii), (v), (vi)
	§2	12.	(iv) $\left[\frac{3.09}{0.03} \times \frac{100}{100} = \frac{309}{3} = 103\right]$
	§2	13.	(i) 31,000.027 (ii) 500,000.002
4	§2	14.	(ii), (v)
	§2	15.	(ii)
	§3, 4, 5	16.	(v), (vi)
	§4	17.	$\frac{2x^3}{y}$
5	§1	18.	$x = 1$
	§2	19.	(iii)
	§3	20.	$x = 2,\ y = -1$
6	§3	21.	$-\frac{4}{3}$
	§4	22.	(i) $x = \frac{1}{2}$ (ii) $y = \frac{2}{3}$
	§4	23.	(iv)

Topic	Section	Question	Answer(s)
	§5	24.	
7	§1	25.	(iv)
	§2	26.	$(2x+1)(3x-2)$
	§2	27.	$(2x+1)(2x-1)$
	§3	28.	(i) -1 (ii) 0 (iii) 0
	§4	29.	$x = 1\frac{1}{2}, -\frac{1}{2}$
8	§3	30.	
9	§2,3	31.	(i) $x > 2$ (ii) $x < -3$ (iii) $x > 1$
10	§2,3,5	32.	(i) $x = 70, y = 40$ (ii) $t = 120, w = 60$ (iii) $z = 90$
	§6, 7	33.	(i)

For Q. 24: Lines $2x + y = 3$ and $x - 2y = 4$ intersecting at $(2, -1)$. Refer to Q. 20.

For Q. 30:
(i) Axis of symmetry: $x = 1\frac{1}{2}$
(ii) Vertex: $(1\frac{1}{2}, -\frac{1}{4})$

Topic	Section	Question	Answer(s)
11	§2	34.	(ii)
12	§3	35.	(i) $\frac{\pi}{3}$ (ii) $\frac{\pi}{12}$ (iii) $\frac{5\pi}{12}$ (iv) $\frac{\pi}{4}$
	§2	36.	10 metres $[\sin 30° = \frac{1}{2} = \frac{\text{height}}{20}]$
13	§1	37.	These are all 4×3 matrices.
	§1	38.	$B_{12} = 0$, $B_{23} = -3$, $B_{41} = -4$
	§1	39.	$\begin{bmatrix} 1 & -3 & 2 \\ 3 & 1 & 9 \\ 2 & 0 & 0 \end{bmatrix}$
	§4	40.	$AB = \begin{bmatrix} 1 & 3 \\ 0 & 2 \end{bmatrix}$
14	§4	41.	$\frac{1}{3}$ of a unit of area.
	§4	42.	Antiderivative $y = \left(\frac{1}{2}\right) \sin(2x) +$ constant.
	§4	43.	Average value $= \left(\frac{1}{\pi}\right)[-\cos(\pi) + \cos(0)] = \frac{2}{\pi}$
15	§4	44.	(a)
	§4	45.	(c)
16	§4	46.	$\frac{2}{3}$
	§4	47.	$\frac{3}{12} = \frac{1}{4}$
17	§4	48.	13
	§4	49.	(d) The distribution is skewed.
	§4	50.	(a) The mean is 3 and the median is 3.