

(Marks)

- (1) 1. Simplify  $(x^2 + 4x + 2) - (x^2 - x + 9)$ .
2. Simplify each expression, giving answers having positive exponents only.
- (2) (a)  $\frac{6(x^2y^{-4})^{-3}}{2^3x^{-5}y^4}$
- (1) (b)  $(27x^{-6})^{1/3}$
3. Simplify without using a calculator (give exact values).
- (1) (a)  $(1 - \sqrt{6})^2$
- (1) (b)  $16^{5/4} + \sqrt[5]{-32}$
- (2) 4. Rationalize the denominator of  $\frac{12}{\sqrt{5} + 1}$  and simplify.
5. Factor completely.
- (2) (a)  $2x^3 - 16$
- (2) (b)  $3x^2 + 7x - 6$
6. Perform the following operations and simplify your answers.
- (2) (a)  $\frac{x^2 + x - 6}{x^3 + x^2} \div \frac{x^2 - 4}{x^3 + 3x^2 + 2x}$
- (3) (b)  $\frac{3}{x^3} - \frac{1}{x} + \frac{1}{x - 2}$
- (3) 7. Use long division to find the quotient and remainder:  $\frac{4x^3 - 6x^2 + 5}{2x + 1}$
8. Given the two points  $A(2, 7)$  and  $B(5, 1)$ , find:
- (1) (a) the distance between  $A$  and  $B$
- (1) (b) the midpoint of the line segment  $AB$
- (2) (c) an equation of the line through  $A$  and  $B$
- (1) (d) an equation of the line perpendicular to  $AB$  and having  $y$ -intercept 4
- (1) 9. Find an equation of the line parallel to the  $y$ -axis and passing through the point  $(5, -7)$ .
10. Solve each of the following for  $x$ .
- (2) (a)  $x(x + 1) = x^2 - 2(x + 3)$
- (2) (b)  $x^3 - x = 0$
- (2) (c)  $x^2 + 2x - 6 = 0$
- (3) (d)  $\frac{1}{x - 5} + \frac{2}{(x + 3)(x - 5)} = \frac{1}{(x - 1)(x + 3)}$
- (2) (e)  $\sqrt{3x^2 - 26} = x + 2$
- (2) (f)  $5 - 3x \leq 4x - 5$
- (2) (g)  $\log(5x + 20) - \log(x - 2) = 1$

(Marks)

(2) (h)  $3e^{2x} - 1 = 23$  (Round your answer to two decimal places.)

(2) 11. Find the domain of the function  $y = \frac{\sqrt{4-x}}{x}$ .

(3) 12. Given  $f(x) = 3x - x^2$ , find and simplify  $\frac{f(x+h) - f(x)}{h}$ .

(3) 13. Sketch the graph of  $f(x) = -x^2 + 4x - 4$  and state each of the following:

Vertex:

 $x$ -intercept(s): $y$ -intercept:

Range:

(3) 14. Sketch the graph of  $y = \frac{2x+3}{x+1}$  and state each of the following:

 $x$ -intercept(s): $y$ -intercept:

Vertical asymptote:

Horizontal asymptote:

(2) 15. Sketch the graph of  $f(x) = \begin{cases} x+3, & \text{if } x < 1 \\ 3-x, & \text{if } x \geq 1 \end{cases}$

16. Find the inverse of each of the following functions.

(2) (a)  $f(x) = \frac{2-x}{3x}$

(1) (b)  $g(x) = e^x$

(3) 17. Sketch the graph of  $y = 2^x - 4$  and state each of the following:

 $y$ -intercept:

Horizontal asymptote:

(3) 18. Sketch the graph of  $f(x) = -\ln x$  and state each of the following:

 $x$ -intercept(s):

Vertical asymptote:

19. Simplify each of the following expressions.

(1) (a)  $\log_3 243$

(1) (b)  $e^{\ln x}$

(1) 20. Approximate  $\log_5 100$  to four decimal place accuracy.

(2) 21. Expand  $\log \frac{\sqrt{x+1}}{yz^3}$  in terms of the simplest possible logarithms.

(Marks)

22. Convert:

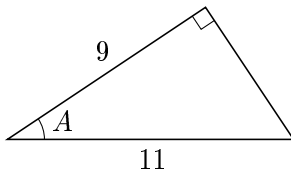
- (1) (a)  $12^\circ$  to radians (give the exact answer)
- (1) (b)  $\frac{7\pi}{4}$  radians to degrees
- (1) (c)  $0.6$  radians to degrees (two decimal places)

(1) 23. What is the complement of  $53^\circ$ ?

24. Evaluate (if possible) to four decimal place accuracy:

- (1) (a)  $\sin(6 \text{ radians})$
- (1) (b)  $\tan^{-1}(2)$  (answer in degrees)
- (1) (c)  $\sec 131^\circ$
- (1) (d) the acute angle  $\theta$  with  $\csc \theta = 0.7071$  (answer in degrees)

(2) 25. Stephanie ties a 25-metre string to the classroom window. Shannon is outside and grabs the end of the string. She pulls the string tight so it is straight, and ties it to a rock she found on the grass. The string makes an angle of  $22^\circ$  with the ground. How high (to two decimal places) is the other end of the string?

(1) 26. Find angle  $A$  (accurate to two decimal places) in the right triangle(1) 27. (a) What is the reference angle of  $-150^\circ$ ?(1) (b) Find the exact value of  $\cos(-150^\circ)$ .(2) 28.  $\tan A = -1$ . Find two possible values for  $A$  between  $0^\circ$  and  $360^\circ$ .(1) 29.  $B$  is an angle in Quadrant II with  $\sin B = \frac{\sqrt{3}}{2}$ . Find  $B$  (between  $0^\circ$  and  $360^\circ$ ).(1) 30.  $C$  is an angle in Quadrant IV with  $\cos C = \frac{2}{3}$ . Find the exact value of  $\tan C$ .

31. Prove each of the following identities.

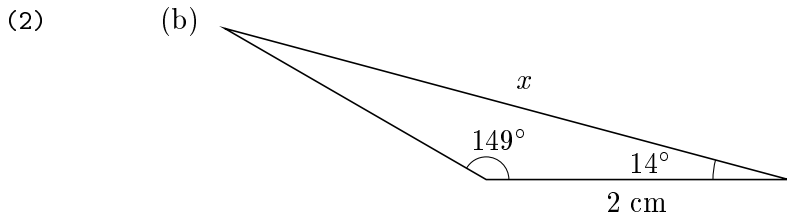
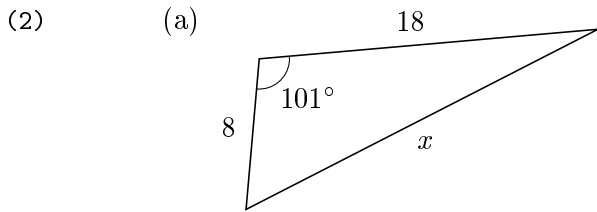
(2) (a)  $\sec A \cot A = \csc A$ (2) (b)  $(1 - \cos B)(1 + \cos B) = \frac{\sin B}{\csc B}$ (3) 32. Sketch two cycles of the graph of  $y = 5 \cos\left(\frac{\pi}{2}x\right)$  and state each of the following:

Amplitude:

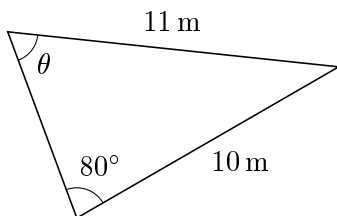
Period:

33. Find side  $x$  (accurate to two decimal places) in each of the following triangles.

(Marks)

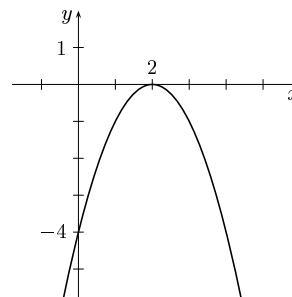


(2) 34. Find angle  $\theta$  (accurate to two decimal places) in the triangle

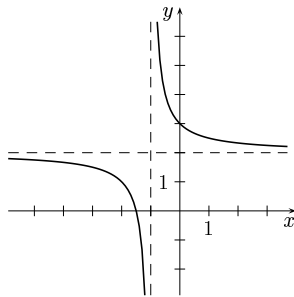


## ANSWERS

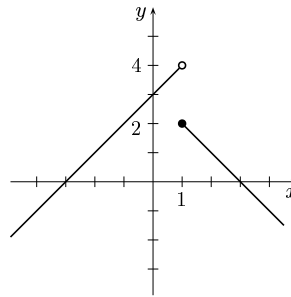
1.  $5x - 7$     2. (a)  $\frac{3y^8}{4x}$     (b)  $\frac{3}{x^2}$     3. (a)  $7 - 2\sqrt{6}$     (b) 30    4.  $3(\sqrt{5} - 1)$
5. (a)  $2(x - 2)(x^2 + 2x + 4)$     (b)  $(3x - 2)(x + 3)$     6. (a)  $\frac{x + 3}{x}$     (b)  $\frac{2x^2 + 3x - 6}{x^3(x - 2)}$
7.  $2x^2 - 4x + 2 + \frac{3}{2x + 1}$     8. (a)  $\sqrt{45} = 3\sqrt{5}$     (b)  $(\frac{7}{2}, 4)$     (c)  $y = -2x + 11$     (d)  $y = \frac{1}{2}x + 4$     9.  $x = 5$
10. (a)  $x = -2$     (b)  $x = 0, 1, -1$     (c)  $x = \frac{-2 \pm \sqrt{28}}{2} = -1 \pm \sqrt{7}$     (d)  $x = 0$     (e)  $x = 5$     (f)  $x \geq \frac{10}{7}$   
 (g)  $x = 8$     (h)  $x = \frac{1}{2} \ln 8 \approx 1.04$
11. all  $x \leq 4$  except 0    12.  $3 - 2x - h$     13. vertex: (2, 0)  
 $x$ -int.: (2, 0)  
 $y$ -int.: (0, -4)  
 range: all  $y \leq 0$



14.  $x$ -int.:  $(-\frac{3}{2}, 0)$   
 $y$ -int.:  $(0, 3)$   
 VA:  $x = -1$   
 HA:  $y = 2$

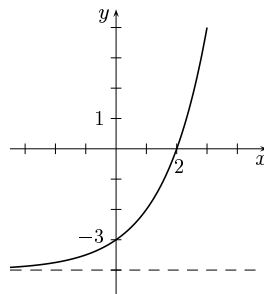


15.

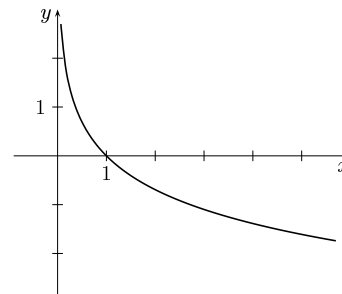


16. (a)  $f^{-1}(x) = \frac{2}{3x+1}$   
 (b)  $g^{-1}(x) = \ln x$

17.  $y$ -int.:  $(0, -3)$   
 HA:  $y = -4$



18.  $x$ -int.:  $(1, 0)$   
 VA:  $x = 0$

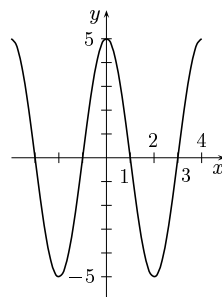


19. (a) 5 (b)  $x$  20. 2.8614 21.  $\frac{1}{2} \log(x+1) - \log y - 3 \log z$  22. (a)  $\frac{\pi}{15}$  (b)  $315^\circ$  (c)  $34.38^\circ$   
 23.  $37^\circ$  24. (a)  $-0.2794$  (b)  $63.4349^\circ$  (c)  $-1.5243$  (d)  $\theta$  does not exist 25. 9.37 m 26.  $35.10^\circ$   
 27. (a)  $30^\circ$  (b)  $-\frac{\sqrt{3}}{2}$  28.  $135^\circ, 315^\circ$  29.  $120^\circ$  30.  $-\frac{\sqrt{5}}{2}$

31. (a)  $\sec A \cot A = \frac{1}{\cos A} \cdot \frac{\cos A}{\sin A} = \frac{1}{\sin A} = \csc A$

(b)  $(1 - \cos B)(1 + \cos B) = 1 - \cos^2 B = \sin^2 B = \frac{\sin B}{1/\sin B} = \frac{\sin B}{\csc B}$

32. Amplitude: 5  
 Period: 4



33. (a) 21.05 (b) 3.52 cm 34.  $63.54^\circ$