

Marks

- (2) 1. Simplify each expression. Answers should have only positive exponents and simplified radicals.

a) $\sqrt[4]{81x^5y^8z^6}$

b) $\left(\frac{2(ab^2c^3)^2a^2b}{(ab^2)^3c^4}\right)^{-2}$

- (2) 2. Find the exact value
- without using a calculator.**

a) $(\sqrt{18} - 2\sqrt{3})^2$

b) $16^{\frac{1}{4}} + 3(27)^{\frac{2}{3}} - 8(1)^{-5}$

- (2) 3. Use long division to find the quotient and the remainder of
- $\frac{10x^5 + x^3 + 5x^2 - 2x - 2}{5x^2 - 2}$
- .

- (2) 4. Rationalize the denominator and simplify:
- $\frac{5}{3\sqrt{3} - \sqrt{2}}$

- (2) 5. Rationalize the numerator and simplify:
- $\frac{\sqrt{5x} - \sqrt{5x+5h}}{h}$

- (7) 6. Factor completely:

a) $ax - 4x - ay + 4y$

b) $6x^2 - x - 15$

c) $27x^3 - 8$

d) $4x^2y - 64y$

- (10) 7. Perform the indicated operations and simplify the results.

a) $(2x - 3y)(4x^2 + 6xy + 9y^2)$

b) $\frac{x^2 - 9}{x^2 + 2x - 3} \cdot \frac{x^2 - x}{x^2 + 6x + 9}$
 $\frac{2}{-} - \frac{3}{-}$

c) $\frac{3x+1}{x^2+5x} - \frac{6x-5}{2x^2+9x-5} + \frac{x-4}{2x^2-x}$

d) $\frac{\frac{x}{4y-6x} - \frac{y}{xy}}$

- (4) 8. Consider two points
- $A(5, -5)$
- and
- $B(2, -3)$

a) Find the equation of the horizontal line through point B .b) Find an equation of the line passing through points A and B .c) Find the midpoint of the line segment \overline{AB} d) Find the distance between points A and B .

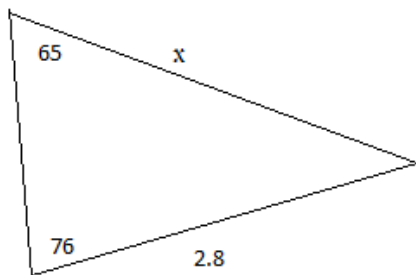
- (6) 9. Consider the line
- L
- given by the equation
- $y = \frac{2}{3}x + 2$
- .

a) Find the x -intercept and y -intercept of the line L .b) Find an equation of the line that passes through $(0,0)$ and is parallel to L .c) Find an equation of the line through $(0,-2)$ and is perpendicular to L .d) Graph line L and lines obtained in parts b) and c) the same coordinate system.

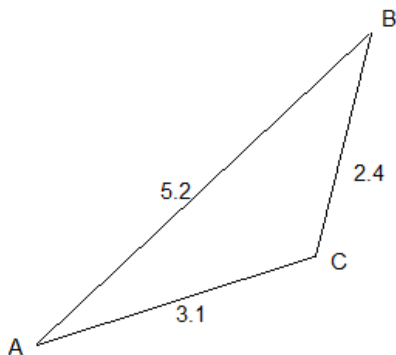
(Label each line and the important points on each line.)

- (1) 10. Solve for x : $2x - (5 - x) \leq 3(2x + 4) - 2$
- (4) 11. Solve one quadratic equation by factoring and the other using quadratic formula.
a) $(x + 2)^2 = 8x$ b) $3x^2 - 5x - 2 = 0$
- (8) 12. Solve for x or state that there is no solution. Give exact and simplified answers.
a) $3x + \frac{1}{2}(6x + 4) - 2 = x + 15$ b) $\frac{2}{x-1} + \frac{x}{x+1} = 1 - \frac{1}{x^2 - 1}$
c) $\sqrt{x+7} = x - 5$ d) $\log(x) = \log(2) - \log(x-1)$
e) $8^{x^2-4} = 1$
- (5) 13. Given the functions $f(x) = 3 - x^2$ and $g(x) = \sqrt{x+1}$, find and simplify where possible:
a) The domain of g b) $f(-1)$
c) $(f \circ g)(x)$ d) $\frac{f(x+h) - f(x)}{h}$
- (4) 14. Find the vertex, all intercepts, the equation of the axis of symmetry, state the domain and range and sketch the graph of the quadratic function $f(x) = x^2 + 4x - 5$
- (3) 15. Find all intercepts, and the equations of vertical and horizontal asymptotes of $y = \frac{x+2}{x^2 - x - 2}$
- (2) 16. Find the inverse of the function $g(x) = \frac{5x+3}{2x-1}$.
- (4) 17. Graph the following piecewise-defined function $f(x)$ and state its range.
$$f(x) = \begin{cases} 2x+5, & \text{if } x \leq -2 \\ x^2 - 1, & \text{if } x > -2 \end{cases}$$
- (2) 18. \$3200 is invested at an annual rate of 4% interest compounded quarterly. What is the value of the investment after 7 years? Round your answer to two decimal places.
- (2) 19. Graph $f(x) = \log x$. Label all intercept(s) and asymptote(s), and state the domain and range.
- (2) 20. Evaluate each expression without using a calculator.
a) $2\log_4\left(\frac{1}{16}\right)$ b) $\log_3(9^5)$
- (2) 21. Write as a single logarithm: $2\log_6(x+3) + 3\log_6(x-3) - \frac{1}{2}\log_6(2x^3)$
- (2) 22. Write as sum/difference of multiples of logarithms: $\log_4\left(\frac{2y^4 \sqrt[5]{x^2+1}}{(3x-2)^2}\right)$
- (2) 23. Convert between radians and degrees. Give exact answers.
a) 28° b) $\frac{2\pi}{5}$

- (2) 24. Let θ be the angle in standard position with terminal side containing the point $(-5, -1)$. Find the exact value of:
- a) $\sec\theta$ b) $\tan\theta$
- (2) 25. Use your calculator to approximate to four decimal places.
- a) $\sin\left(\frac{6\pi}{7}\right)$ b) $\csc(115^\circ)$
- (2) 26. For the angle $\theta = -\frac{\pi}{3}$.
- a) Sketch and state the reference angle
- b) **Without using a calculator** find the exact value of $\cot\left(-\frac{\pi}{3}\right)$.
- (2) 27. Find two angles θ in $[0, 360^\circ)$ for which $\cot\theta = -1$.
- (2) 28. Verify the identity: $\sec x - \sin x \tan x = \cos x$
- (3) 29. State the amplitude and period, then graph two cycles of $y = -6\sin(\pi x)$
- (3) 30. From your boat, you can see that the angle of elevation to the top of the 50 m cliff is 68.2° . What is the distance from your boat to the base of the cliff? (Round your answers to the nearest meter.)
- (2) 31. For the following triangle, find the length of side x . (Round your answer to 1 decimal place.)

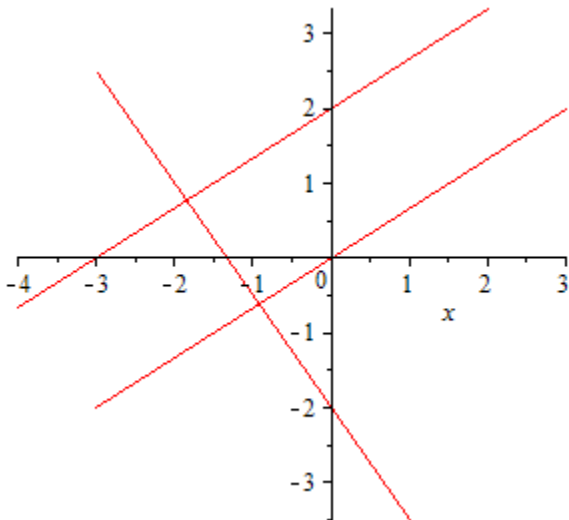


- (2) 32. For the following triangle $\triangle ABC$, find the angle C . (Round your answer to 1 decimal place.)



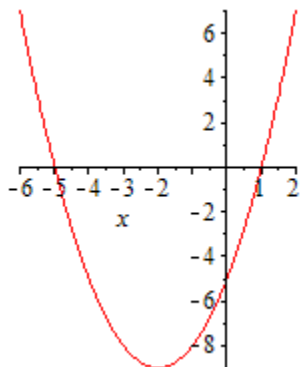
ANSWERS:

1. a) $3xy^2z \cdot \sqrt[4]{xz^2}$ b) $\frac{b^2}{4a^2c^4}$ 2. a) $30-12\sqrt{6}$ b) 21
3. $2x^3 + x + 1$, remainder 0 4. $\frac{3\sqrt{3} + \sqrt{2}}{5}$ 5. $\frac{-5}{\sqrt{5x} + \sqrt{5x+5h}}$
6. a) $(x-y)(a-4)$ b) $(3x-5)(2x+3)$ c) $(3x-2)(9x^2 + 6x + 4)$ d) $4y(x+4)(x-4)$
7. a) $8x^3 - 27y^3$ b) $\frac{x(x-3)}{(x+3)^2}$ c) $\frac{x^2 + 5x - 21}{x(x+5)(2x-1)}$ d) $\frac{1}{2}$
8. a) $y = -3$ b) $y = -\frac{2}{3}x - \frac{5}{3}$ c) $(\frac{7}{2}, -4)$ d) $\sqrt{13}$
9. a) $(-3,0)$ and $(0,2)$ b) $y = \frac{2}{3}x$ c) $y = -\frac{3}{2}x - 2$
d)



10. $x \geq -5$ 11. a) $x = 2$ b) $x = 2$ or $x = -\frac{1}{3}$
12. a) $x = 3$ b) $x = -4$ c) $x = 9$ d) $x = 2$ e) $x = \pm 2$
13. a) $x \geq -1$ b) 2 c) $2-x$ d) $-2x-h$

14.

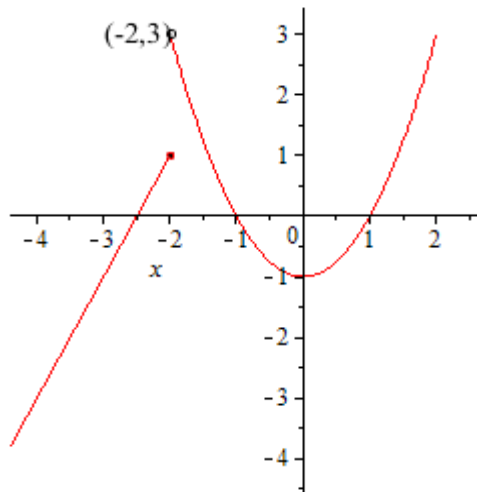


Vertex: $(-2, -9)$
 x -intercepts: $(-5, 0)$ and $(1, 0)$
 y -intercept: $(0, -5)$
axis of symmetry: $x = -2$
domain: \mathfrak{R}
range: $[-9, \infty)$

15. x -intercept: $(-2, 0)$, y -intercept: $(0, -1)$, V.A.: $x = 2$ and $x = -1$, H.A.: $y = 0$

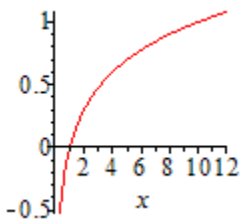
16. $g^{-1}(x) = \frac{x+3}{2x-5}$.

17. Range: \mathfrak{R}



18. \$4228.13

19.



x -intercept: (1, 0)
 V.A.: $x = 0$
 domain: $x > 0$
 range: \mathfrak{R}

20. a) -4 b) 10

21. $\log_6 \frac{(x+3)^2(x-3)^3}{\sqrt{2x^3}}$

22. $\frac{1}{2} + 4\log_4 y + \frac{1}{5}\log_4(x^2 + 1) - 2\log_4(3x - 2)$

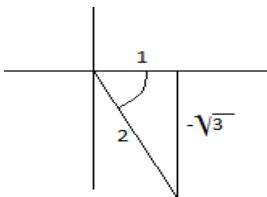
23. a) $\frac{7\pi}{45}$ b) 72°

24. a) $-\frac{\sqrt{26}}{5}$ b) $\frac{1}{5}$

25. a) 0.4339 b) 1.1034

26. a) reference angle $\theta' = \frac{\pi}{3}$

b) $-\frac{\sqrt{3}}{3}$



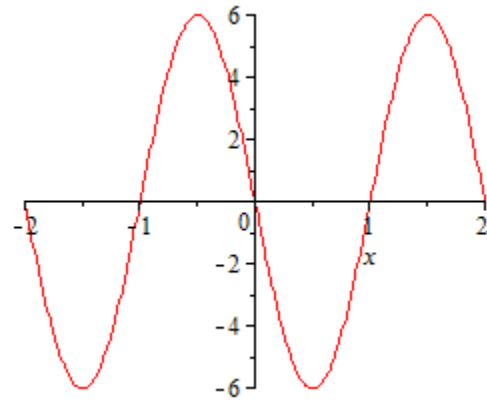
27. 135° and 315°

28. $LHS = \sec x - \sin x \tan x = \frac{1}{\cos x} - \sin x \cdot \frac{\sin x}{\cos x} = \frac{1 - \sin^2 x}{\cos x} = \frac{\cos^2 x}{\cos x} = \cos x = RHS$

29.

$$A = 6$$

$$P = 2$$



30. 20 m

31. $x = 3.0$

32. 141.7°