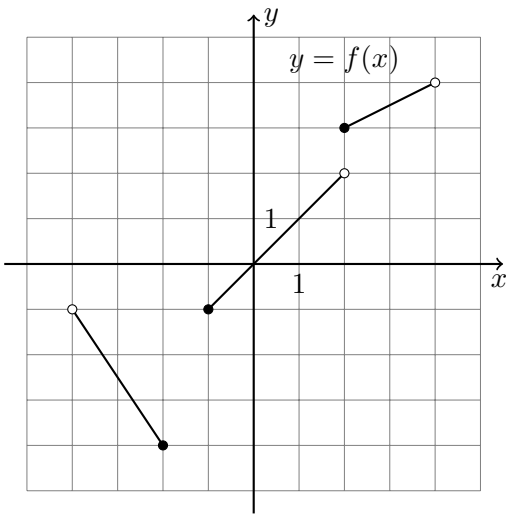
[7] **1.** Let $g(x) = 3x + 4$ and f be given by the graph below.



(a) What is the range of f?

If possible, evaluate the following or state that it is undefined:

(b) $(3f - 2g)(1) =$

(c) $(g \circ f)(2) =$

(d) $f^{-1}(3) =$

(e) $(f \circ f^{-1})(-4) =$

[3] **2.** Simplify the following expression as much as possible and eliminate negative exponents.

$$\left(3(a^2b^4c^{-2})^{-3}c^5\right)^{-2}$$

[3] **3.** Factor completely.
$2x^3 + x^2 - 18x - 9$

[3] **4.** Solve by completing the square.
$x^2 + 4x - 2 = 0$.

[5] **5.** Given the quadratic function: $f(x) = -2x^2 + 4x + 6$:

(a) Find the coordinates of $x-$ and $y-$intercepts.

(b) Find the coordinates of the vertex.

(c) Sketch a graph of the function using the information from the previous parts. Clearly label the vertex and intercepts.

6. Simplify the expression. (Leave your final answer in factored form.)

[4] (a) $\dfrac{x^2 - x - 6}{x^2 + x} \div \dfrac{x^2 - 9}{x + 1}$

[4] (b) $\dfrac{\frac{3}{x} - \frac{2}{x^2}}{9 - \frac{4}{x^2}}$

7. Solve each of the following for x:

[4] (a) $2x^3 + x^2 = 21x$

[4] (b) $\dfrac{x}{x^2 - 16} = \dfrac{2}{x^2 - 4x} - \dfrac{1}{x^2 + 4x}$

[4] (c) $\sqrt{10x - 5} + \sqrt{2x - 5} = 4$

[4] **8.** Solve the inequality: $\dfrac{(x+4)(3-x)}{x+2} \leq 0$

[3] **9.** Use polynomial long division to divide: $(9x^3 - 31x + 18) \div (3x - 4)$
(Express your answer in the form $Q(x) + \frac{R(x)}{D(x)}$.)

[3] **10.** Find the domain of the function $f(x) = \dfrac{\sqrt{10-x}}{3-\sqrt{x+1}}$.

[1] **11.** Use a calculator to evaluate $\log_3(100)$ accurate to four decimal places.

[5] **12.** For the function $f(x) = -\log_4(x+2) + 1$
(a) Find all intercepts.
(b) Write the equation of any asymptotes.
(c) Sketch a graph.

[2] **13.** If \$3500 is invested at 2% interest compounded quarterly, what is the value after 6 years?
(Round your answer to the nearest cent.)

[4] **14.** Express in terms of the simplest possible logarithms:
$\ln\left(\dfrac{x^4 e^x}{\sqrt[3]{x+2}}\right)$

15. Solve for x:

[4] (a) $\log_2(x-2) = 3 - \log_2(x)$

[4] (b) $125^{-3x} = \left(\dfrac{1}{5}\right)^{x-2}$

[5] **16.** The terminal side of an angle θ in standard position contains the point $(-2, 1)$.
(a) Find all six trig functions of θ. Give simplified exact values. (No decimals)

(b) Find the angle θ in the interval $[0°, 360°)$ accurate to one decimal place.

[3] **17.** (a) Sketch the angle $\theta = \frac{4\pi}{3}$ in standard position.
(b) Without using a calculator evaluate $\sin\left(\frac{4\pi}{3}\right)$. Give an exact value and justify your answer.

[3] **18.** Without using a calculator find all angles θ in $[0, 2\pi)$ such that $\cot\theta = -1$.

[3] **19.** Prove the identity: $\dfrac{1}{1-\cos x} + \dfrac{1}{1+\cos x} = 2\csc^2 x$

[4] **20.** Identify the amplitude, period, and sketch at least two cycles of the function $f(x) = -3\sin\left(\frac{1}{2}x\right)$

[3] **21.** The angle of elevation to the top of the IBM-Marathon Tower in Montreal is found to be 12.79° from the ground at a distance of 1000 meters from the base of the building. Using this information, find the height of the IBM-Marathon Tower in meters.

[5] **22.** A triangle has sides of length $a,\ b,\ c$ across from angles of measure $A,\ B,\ C$ respectively. If $a = 6$, $b = 9$ and $A = 20°$ there are two possible triangles. Find c, B, and C for the two triangles. (Give answers accurate to two decimal places.)

[3] **23.** Two similar boxes were built out of cardboard. One has volume 135 cm^3, the other 5 cm^3. If 21 cm^2 of cardboard was used to build the smaller box, how much cardboard was used to build the bigger one?

ANSWERS

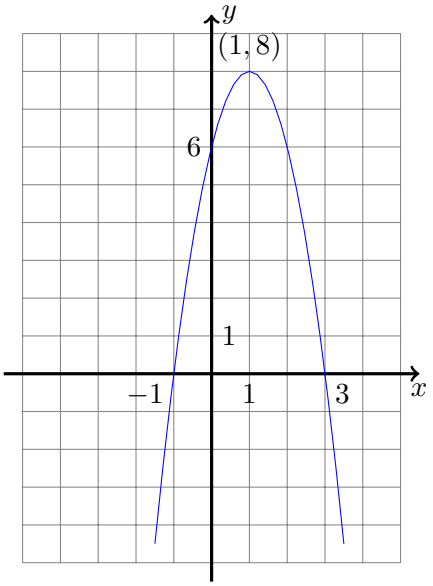
1. (a) $[-4, 2) \cup [3, 4)$
(b) -11
(c) 13
(d) 2
(e) -4

2. $\dfrac{a^{12}b^{24}}{9c^{22}}$

3. $(x + 3)(x - 3)(2x + 1)$

4. $x = -2 \pm \sqrt{6}$.

5. (a) $(0, 6), (-1, 0), (3, 0)$
(b) $(1, 8)$
(c)



6. (a) $\dfrac{x+2}{x(x+3)}$

(b) $\dfrac{1}{3x+2}$

7. (a) $-\frac{7}{2}, 0, 3$

(b) -3

(c) No solution

8. $[-4,-2) \cup [3,\infty)$

9. $3x^2+4x-5-\dfrac{2}{3x-4}$

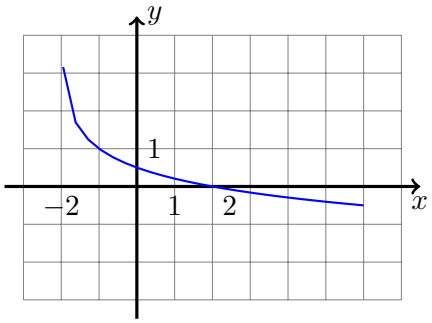
10. $[-1,8) \cup (8,10]$

11. 4.1918

12. (a) $(0,\frac{1}{2}), (2,0)$

(b) $x=-2$

(c)



13. \$3945.06

14. $4\ln x + x - \frac{1}{3}\ln(x+2)$

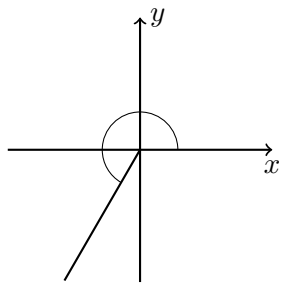
15. (a) 4

(b) $-\frac{1}{4}$

16. (a) $\sin\theta = \dfrac{\sqrt{5}}{5}$, $\cos\theta = -\dfrac{2\sqrt{5}}{5}$, $\tan\theta = -\dfrac{1}{2}$, $\csc\theta = \sqrt{5}$, $\sec\theta = -\dfrac{\sqrt{5}}{2}$, $\cot\theta = -2$.

(b) 153.4°

17. (a)

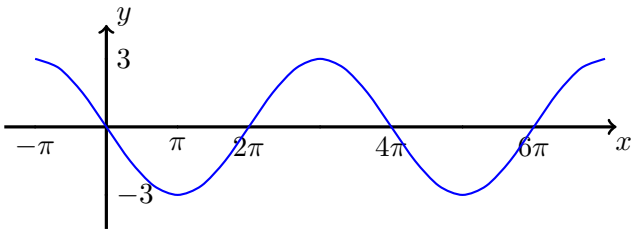


(b) $-\dfrac{\sqrt{3}}{2}$

18. $\dfrac{3\pi}{4}, \dfrac{7\pi}{4}$.

19.

20. amplitude $= 3$, period $= 4\pi$, $f(x) = -3\sin\left(\frac{1}{2}x\right)$



21. 227 m

22. $c_1 \approx 13.61$, $B_1 \approx 30.87°$, $C_1 \approx 129.13°$ Or $c_2 \approx 3.31$, $B_2 \approx 149.13°$, $C_2 \approx 10.87°$

23. 189 cm^2