Multiple choice

For each of the following questions, there is only one correct answer. Circle your choice. If two choices are selected for the same question, no marks will be awarded.

1. Which of these curves has the same y-intercept as $y = 3x - 2$?

A. $y = x^2 + 2$

B. $y = (x-1)^2 - 3$

C. $y = (x-2)^2$

D. $y = (x+2)^2$

2. If that $f(x) = 3x - 2$ and $g(f(x)) = x$, then:

A. $g(x) = \dfrac{x+2}{3}$

B. $g(x) = \dfrac{x}{3x-2}$

C. $g(x) = f(x)$

D. $g(x) = \dfrac{3x-2}{x}$

3. What is the domain of: $f(x) = \frac{(x+3)(x+4)(x-4)}{(x+4)(x-5)(x-7)}$?

A. $\mathbb{R} \setminus \{-3, -4, 4, 5, 7\}$

B. $\mathbb{R} \setminus \{-4, 5, 7\}$

C. $\mathbb{R} \setminus \{5, 7\}$

D. $\mathbb{R} \setminus \{-3, -4, 4\}$

4. What is the domain of: $\dfrac{\sqrt{x-3}}{\sqrt{5-x}}$

A. $[3, 5]$

B. $[3, 5)$

C. $(-\infty, 3) \cup (5, \infty)$

D. $(-\infty, 3] \cup [5, \infty)$

E. $x \neq 5$

F. F: $x < 5$

5. What is the domain of: $\dfrac{x-3}{\sqrt[3]{5-x}}$

A. $[3, 5]$

B. $[3, 5)$

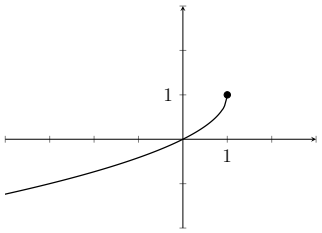
C. $(-\infty, 3) \cup (5, \infty)$

D. $(-\infty, 3] \cup [5, \infty)$

E. $x \neq 5$

F. $x < 5$

6. Find an equation for the following graph:



A. $y = 1 + \sqrt{x-1}$

B. $y = 1 - \sqrt{x-1}$

C. $y = 1 - \sqrt{-x+1}$

D. $y = 1 + \sqrt{-x+1}$

7. If $\log(x) = 2$ and $\log(y) = 3$, then $\log(\frac{x^2}{y}) =$

A. 1

B. 2

C. 3

D. 4

8. Which of the following statements is always true:

A. $\ln x - \ln y = \frac{\ln x}{\ln y}$

B. $\log(x^2 - 9) = 2\log x - \log 9$

C. $\log(x)\log(y) = \log(x+y)$

D. $\log_b(b^b) = b$ with $(b > 0)$

9. The inverse of $f(x) = e^{\log x}$ is

A. $f^{-1}(x) = \log\left(e^x\right)$

B. $f^{-1}(x) = 10^{\ln x}$

C. $f^{-1}(x) = \ln\left(10^x\right)$

D. $f^{-1}(x) = 2^{\ln x}$

10. The graph of $f(x) = 5 \cdot 2^{(3-x)} - 4$ has

A. a vertical asymptote $x = 3$

B. a vertical asymptote $x = -4$

C. a horizontal asymptote $y = 3$

D. a horizontal asymptote $y = -4$

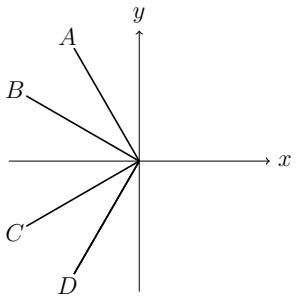
11. The terminal sides of four angles $A, B, C,$ and D in standard position are shown below. Which of the following numbers is the greatest?

A. $\tan A$

B. $\tan B$

C. $\tan C$

D. $\tan D$



12. Let $\vec{u} = \langle -5, 4\rangle$ and $\vec{v} = \langle -1, -3\rangle$. Then the smallest, positive angle between $\vec{u}$ and $\vec{v}$ is closest to which of the following:

A. $50°$

B. $70°$

C. $110°$

D. $130°$

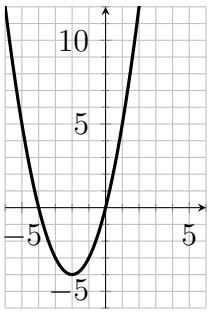
E. $150°$

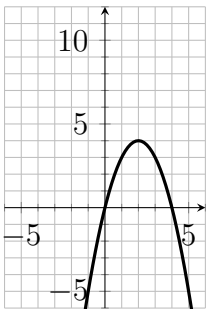
Short Answer

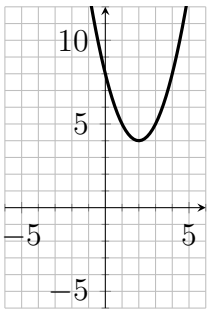
13. Let $f(x) = x + 1$ and $g(x) = x(x - 2)$. Simplify $(g \circ f)(x)$.

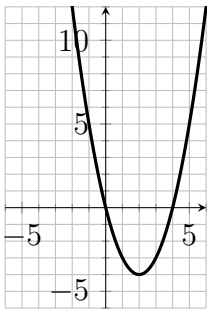
14. Match each of the following functions with their graph.

(a) $y = (x - 2)^2 + 4$ (b) $y = (x + 2)^2 - 4$ (c) $y = 4 - (x - 2)^2$ (d) $y = (x - 2)^2 - 4$









15. Simplify as much as possible: $x - (x - (x - (x - 1)))$.

16. State the domain of $f(x) = \dfrac{\sqrt{x+2}}{x\sqrt{3-x}}$.

17. Factor completely: $16x^3 - 2$.

18. If $\dfrac{3x}{4+x} = 1$ state all possible values of x.

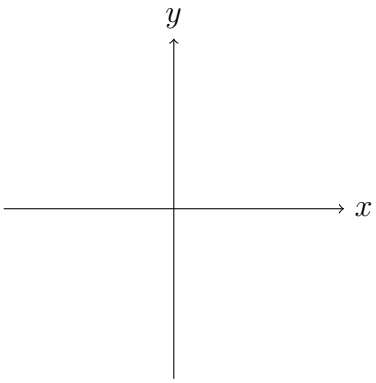
19. The value of $\log_2(32^{(5^2)})$ is _____.

20. If $\log_x(25) = 2$, then $x =$_____

21. Solve $5^{3x} = 625$.

22. Suppose θ is an angle such that $\csc\theta = 5/4$.

(a) Sketch all possible angles θ in standard position on the axes below.



(b) Find all such angles θ in the interval $[0°, 360°)$.

23. Let $\vec{v} = \langle 3, -5\rangle$ and $\vec{w} = \langle 1, 4\rangle$. Determine whether each of the following statements is **True** or **False**.

(a) $\vec{v}$ and $\vec{w}$ are perpendicular. _____

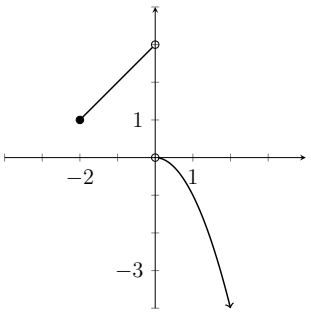
(b) $\vec{v}$ and $\vec{w}$ have the same direction._____

(c) The unit vector in the opposite direction of $\vec{v}$ is $\langle \frac{3}{\sqrt{34}}, \frac{-5}{\sqrt{34}}\rangle$. _____

(d) The magnitude of $\vec{v}$ equals $||\vec{v} + 2\vec{w}||$. _____

Long Answer

24. You are given the function $f(x)$ below.



(a) What is the domain of f?

(b) What is the range of f?

(c) Find $f(f(1))$.

(d) Is f invertible?

25. (a) Solve the equation: $6u^2 - 13u + 6 = 0$.

(b) Now, solve: $6x^4 - 13x^2 + 6 = 0$.

(c) Solve the equation: $6(\ln x)^2 - 13(\ln x) + 6 = 0$.

26. State the domain of $(f+g)(x)$ then simplify $(f+g)(x)$ given that $f(x) = \dfrac{x}{3x+6}$ and $g(x) = \dfrac{-2}{x^2-4}$.

27. State the domain for $(f \circ g)(x)$ then simplify $(f \circ g)(x)$ if $f(x) = \dfrac{2x+3}{x-2}$ and $g(x) = \dfrac{x}{x-3}$.

28. Consider the function $f(x) = 1 - \sqrt{2-x}$ in each of the following equations:

(a) State the domain of f.

(b) State the range of f.

(c) Find the inverse of f.

(d) Sketch a graph of both the function f and its inverse f^{-1}.

29. Write the following expression in terms of logs of x and y.

$$\log\left(x\sqrt{\frac{\sqrt{x}}{y}}\right)$$

30. Solve for x, if possible $\log_2(x-4) = 5 - \log_2(x)$.

31. Let $f(x) = 2^{3-x} - 4$.

(a) Find the intercepts, if any.

(b) Find the equation of any asymptotes.

(c) Sketch the graph

32. Solve the equation $25 \cdot \left(\dfrac{1}{5}\right)^{x^2} = \left(\sqrt{125}\right)^{2-x^2}$.

33. Find all x in $[0, 2\pi)$ such that $\cos x + \sin x \tan x = -\sqrt{2}$.

34. A triangle ABC, with respective sides a, b, c, is such that $a = 4$, $b = 6$, and $C = 20°$. Draw this triangle, and find the measure of the angle B.

Applications

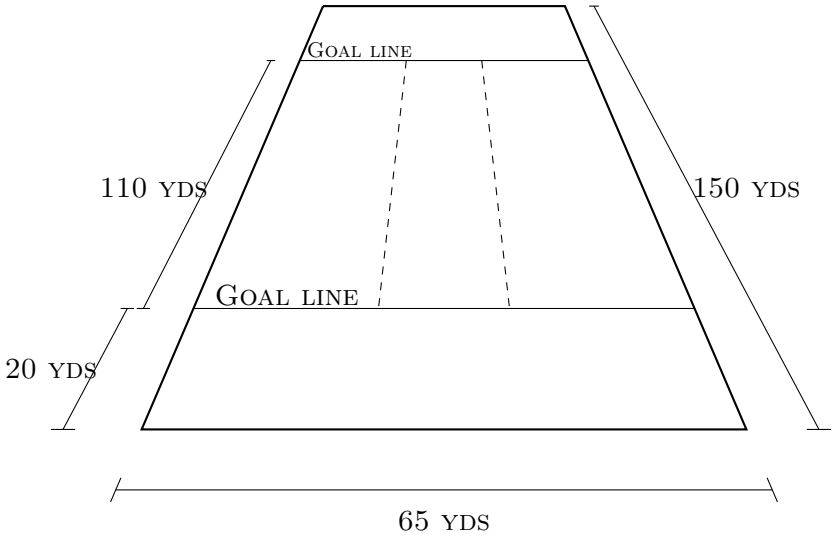
35. Mrs Potter is potting plants. She is using two similar pots, the smaller is 10cm tall and the larger 14cm tall. She has two bags of soil, each containing 30 litres of soil. With the first bag, Mrs Potter fills 20 small pots using all of the soil in the bag. How many large pots can be filled completely using the second bag of soil?

36. Arthur would like to invest \$2000 for 5 years, and has two options: the navy blue savings account at 4.95% interest compounded daily, or the lime green savings account at 4.96% compounded quarterly.

(a) Which option is best? Justify your answer.

(b) How many years would it take for the investment to be worth \$3000 with the best option?

37. You are flying (somehow) above a Canadian football field. Looking down with an angle of depression $40°$ you see the goal line that is closest to you. The other goal line, which is 110 yards further from the point on the ground below you, is at an angle of depression $20°$. How high are you above the ground?



Answers

Multiple choice

1. B	**3.** B	**5.** E	**7.** A	**9.** B	**11.** D
2. A	**4.** B	**6.** C	**8.** D	**10.** D	**12.** C

Short Answer

13. $x^2 - 1$

14. left to right: b-c-a-d

15. 1

16. Domain $= [-2, 0) \cup (0, 3)$

17. $2(2x - 1)(4x^2 + 4x + 1)$

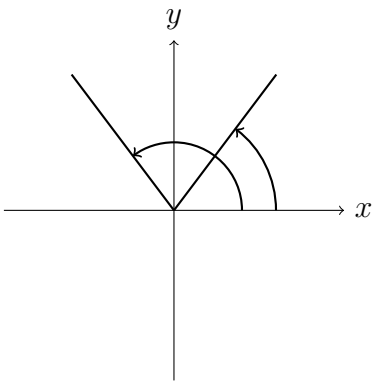
18. $x = 2$

19. 125

20. $x = 5$

21. $x = 4/3$

22. (a) Two possibilities for terminal side:



(b) $\theta = 53.13°, 126.87°$

23. (a) F
(b) F
(c) T
(d) F

Long Answer

24. (a) Domain $= [-2, 0) \cup (0, \infty)$
(b) Range $= (-\infty, 0) \cup [1, 3)$
(c) $f(f(1)) = 2$
(d) yes (passes the horizontal line test)

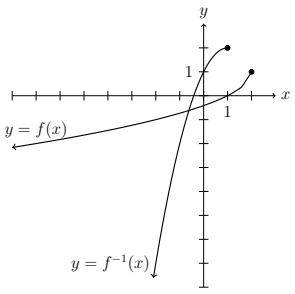
25. (a) $u = 3/2,\ 2/3$
(b) $x = \pm\sqrt{3/2},\ \pm\sqrt{2/3}$
(c) $x = e^{3/2},\ e^{2/3}$

26. Domain $= \mathbb{R} \setminus \{2, -2\}$,
$(f+g)(x) = \dfrac{x^2 - 2x - 6}{3(x+2)(x-2)}$

27. Domain $= \mathbb{R} \setminus \{3, 6\}$, $(f \circ g)(x) = \dfrac{5x-9}{6-x}$

28. (a) Domain $= (-\infty, 2]$
(b) Range $= (-\infty, 1]$
(c) $f^{-1}(x) = -x^2 + 2x + 1$ for $x \leq 1$

(d)

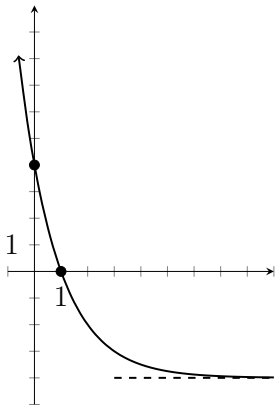


29. $\dfrac{5}{4}\log x - \dfrac{1}{2}\log y$

30. $x = 8$

31. (a) x-intercept $(1, 0)$; y-intercept $(0, 4)$.
(b) Horizontal asymptote $y = -4$.

(c)



32. $x = \sqrt{2}, -\sqrt{2}$

33. $x = 3\pi/4, 5\pi/4$

34. $B \approx 128.60°$

Applications

35. 7 big pots.

36. (a) Navy blue ($2561.60) is slightly better. Lime green = $2559.01.
(b) 8.19 years.

37. 70.71 yards