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. $[3, 5)$

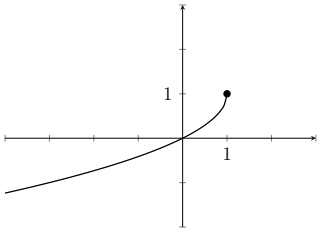
C. $(-\infty, 3) \cup (5, \infty)$

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 $x = 3$

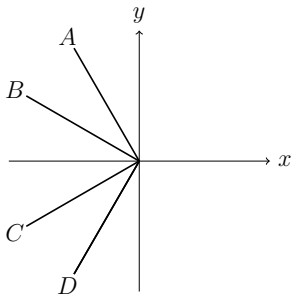
B. a vertical asymptote $x = -4$

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. In the process of solving triangles, in which situation is it possible to have more than one solution?

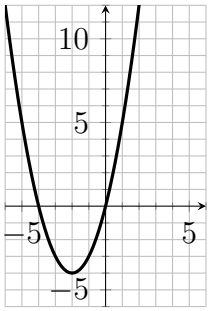
A. side-side-side
B. side-angle-side
C. angle-side-side
D. angle-angle-side

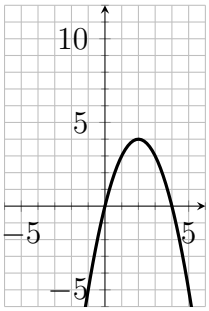
Short Answer

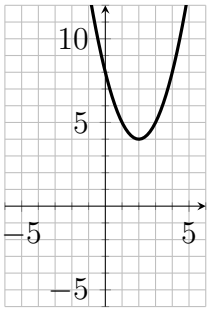
1. Let $f(x) = x + 1$ and $g(x) = x(x - 2)$. Simplify $(g \circ f)(x)$.

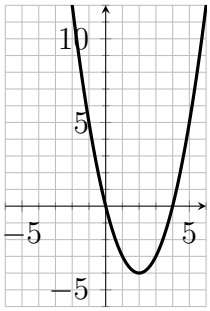
2. Match each of the following functions with their graph.

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









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

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

5. Expand $\left(1 + \sqrt{2x}\right)^2$.

6. Reduce and simplify $\sqrt[3]{-54x^{13}y^{16}z^7}$.

7. Rationalize the denominator of $\dfrac{1}{\sqrt{x} + \sqrt{y}}$.

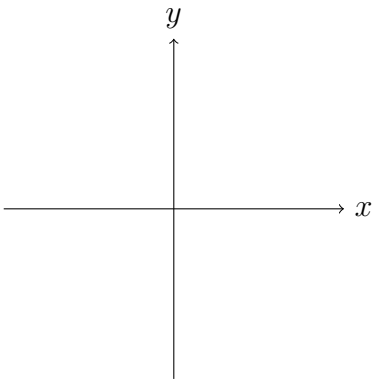
8. The value of $\log_2(32^{(5^2)})$ is _____.

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

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

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

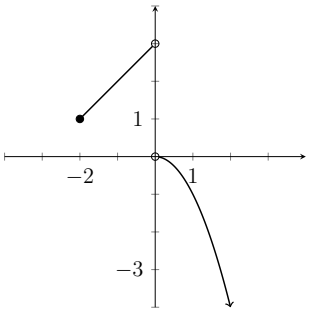
(a) Sketch all possible angles θ in standard position on the axes below.



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

Long Answer

1. 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?

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

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

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

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

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

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

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

7. 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}.

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

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

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

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

(a) Find the intercepts, if any.

(b) Find the equation of any asymptotes.

(c) Sketch the graph

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

12. (a) Simplify: $\cos x + \sin x \tan x$.

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

13. 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.

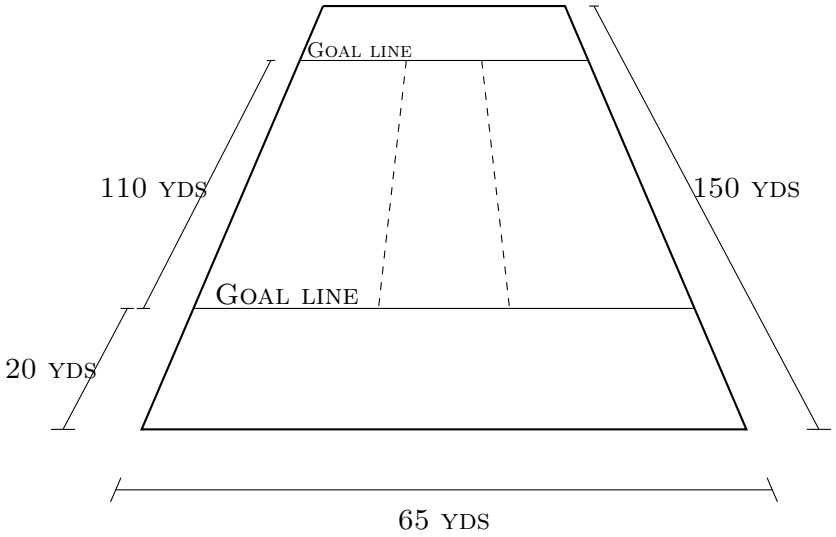
Applications

1. 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?

2. 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

1. $x^2 - 1$

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

3. 1

4. $x = 2$

5. $1 + 2\sqrt{2x} + 2x$

6. $-3x^4y^5z^2\sqrt[3]{2xyz}$

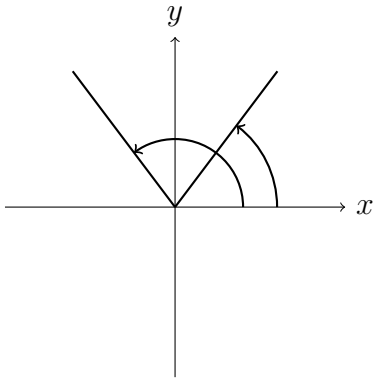
7. $\dfrac{\sqrt{x} - \sqrt{y}}{x - y}$

8. 125

9. $x = 5$

10. $x = 4/3$

11. (a)



(b) $\theta = 53.13°, 126.87°$

Long Answer

1. (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)

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

3. $2(2x - 1)(4x^2 + 4x + 1)$

4. (a) $u = 3/2,\ 2/3$

(b) $x = \pm\sqrt{3/2},\ \pm\sqrt{2/3}$

(c) $x = e^{3/2},\ e^{2/3}$

5. Domain $= \mathbb{R} \setminus \{2, -2\}$,

$$(f+g)(x) = \frac{x^2 - 2x - 6}{3(x+2)(x-2)}$$

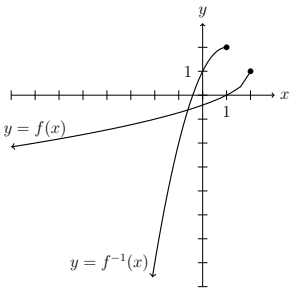
6. Domain $= \mathbb{R} \setminus \{3, 6\}$, $(f \circ g)(x) = \dfrac{5x-9}{6-x}$

7. (a) Domain $= (-\infty, 2]$

(b) Range $= (-\infty, 1]$

(c) $f^{-1}(x) = -x^2 + 2x + 1$ for $x \leq 1$

(d)



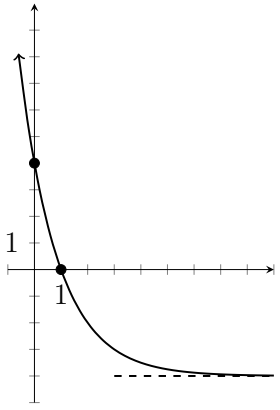
8. $\dfrac{5}{4}\log x - \dfrac{1}{2}\log y$

9. $x = 8$

10. (a) x-intercept $(1, 0)$; y-intercept $(0, 4)$.

(b) Horizontal asymptote $y = -4$.

(c)



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

12. (a) $\sec x$

(b) $x = 3\pi/4, 5\pi/4$

13. $B \approx 128.60°$

Applications

1. (a) Navy blue ($2561.60) is slightly better. Lime green = $2559.01.

(b) 8.19 years.

2. 70.71 yards