

Unit 4 Test

Multiple Choice

For # 1 to #6, choose the best answer.

1. The y-intercept of $y = \frac{3}{x-k} - 1$ is -2.5 .

The non-permissible value for the variable x is

A -5.5

B -2

C 2

D 5.5

2. If $f(x) = \log x$ and $g(x) = x^2 - 4$, the domain of $h(x) = f(g(x))$ is

A $\{x \mid x < -2, x > 2, x \in \mathbb{R}\}$

B $\{x \mid x \leq -2, x \geq 2, x \in \mathbb{R}\}$

C $\{x \mid -2 < x < 2, x \in \mathbb{R}\}$

D $\{x \mid -2 \leq x \leq 2, x \in \mathbb{R}\}$

3. Given $f(x) = x + 1$, $h(x) = \frac{x}{x+1}$, and

$h(x) = \frac{f(x)}{g(x)}$, then

A $g(x) = x, x \neq 0$

B $g(x) = x + 2 + \frac{1}{x}, x \neq 0$

C $g(x) = x^2 + 2x + 1, x \neq -1$

D $g(x) = \frac{x}{(x+1)^2}, x \neq -1$

4. Identify the value not equivalent to ${}_{12}C_r, 0 < r < 12, r \in \mathbb{R}$.

A $\frac{{}_{12}P_r}{r!}$

B ${}_{12}C_{12-r}$

C $\frac{12!}{r!}$

D ${}_{11}C_{r-1} + {}_{11}C_r$

5. There are seven empty seats on the bus and 4 people come on board. The number of ways that the people can be seated is

A $7!$

B $\frac{7!}{4!}$

C ${}_7C_4$

D ${}_7P_4$

6. Mrs. Smith is setting up her new classroom. She has 3 new identical math textbooks and 8 other textbooks. The number of ways that she can arrange these books on a single shelf, if math textbooks must be kept together, is

A $9!$

B $11!$

C $\frac{9!}{3!}$

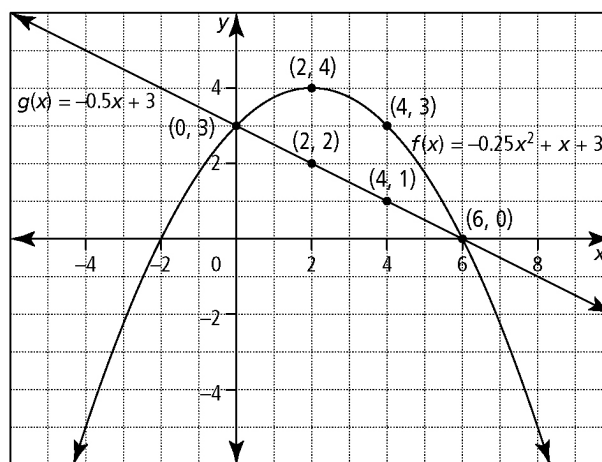
D $\frac{11!}{3!}$

Numerical Response

7. To the nearest hundredth, what is the

greatest root of the equation $\frac{x+1}{3x-5} = \frac{1}{x} + 3$?

8. Use the graph to determine the value of $(f+g)(2)$.



9. Let $f(x) = 2^x$ and $g(x) = \frac{x}{2}$. If $h(x) = 2f(g(x)) - 1$, what is the value of $h(0)$?

10. What is the value of $\frac{81!}{10!} \times \frac{8!}{78!}$?

11. A group of people shake hands once with everyone in the room. If the number of handshakes is 595, how many people are in the room?

12. One term in the expansion of $(x+a)^{10}$ is $61\,236x^5$. Determine the numerical value of a .



Written Response

13. Let $f(x) = \frac{3x+1}{x+1}$.

- a) Sketch the graph of the function $f(x)$.
Identify the equations of all asymptotes.
b) Write the equation of the function $f(x)$ in

the form $y = \frac{a}{x-b} + c$.

- c) Describe how to transform the
graph $y = \frac{1}{x}$ to obtain the graph of $f(x)$.

14. a) Graph the rational function

$$y = \frac{5x}{(x+1)^2} + 10.$$
 Identify the x -intercept(s).

- b) Solve the rational equation

$$\frac{5x}{(x+1)^2} = -10$$
 algebraically.

- c) How are your answers in parts a) and b) related?

15. Consider the functions
- $f(x) = x^2 - 4x - 12$
- and
- $g(x) = x - 6$
- .

- a) Determine an algebraic model

for $y = \frac{f(x)}{g(x)}$ and $y = \frac{g(x)}{f(x)}$ and compare

the domain of each combined function.

- b) Determine a graphical model for

$$y = \frac{f(x)}{g(x)}$$
 and $y = \frac{g(x)}{f(x)}$. Identify all

equations of asymptotes and points of discontinuity in the graph.

16. Given the functions
- $f(x) = \sqrt{x-1}$

and $g(x) = \sqrt{1-x}$ and $h(x) = (fg)(x)$.

- a) Determine the equation of $h(x)$.
b) Compare the graphs of the functions $f(x)$, $g(x)$, and $h(x)$.
c) Compare the domain of the three functions. Explain.

17. Let
- $f(x) = 3x + 1$
- and
- $g(x) = x^2$
- .

- a) Determine the equation of the composite function $y = g \circ f$.
b) Graph the functions g and $g \circ f$ on the same grid.
c) Describe $g \circ f$ as a transformation of $g(x)$ in two ways.

18. The value of a car is given by
- $V = \frac{12}{n+1} + 3$
- ,

where V is the value of the vehicle, in thousands of dollars, and n is the age of the car, in years.

- a) Sketch the graph of the function.
b) Determine the equation of the horizontal asymptote.
c) Explain the meaning of the horizontal asymptote in the context of this question.

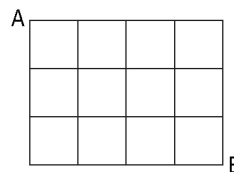
19. State the indicated term in the expansion of the given binomial.

a) middle term of $\left(\frac{\sqrt{x}}{2} - \frac{1}{x}\right)^4$

b) fourth term of $(3x - 2y^2)^7$

c) the constant term of $\left(x^2 + \frac{4}{x^3}\right)^{10}$

20. To travel from point A to point B on the following grid, you can only move east and south.



- a) Determine the number of pathways from A to B using the numbers in Pascal's triangle.
b) Express the number of pathways using factorial notation.

