

2027



6 AP[®] Precalculus

Full-Length Practice Exams

UPDATED FOR THE MAY 2027 AP[®] EXAM

Updated 2027 exam format • 42 MCQ (29 + 13) • 4 FRQ

- 6 Full-Length Exams — 2027 Format
- Answer Keys Included
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6 Full-Length AP[®] Precalculus Practice Exams

Updated for the May 2027 AP[®] Exam Format
42 multiple-choice questions (29 + 13) · 4 free-response questions

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6 Full-Length AP[®] Precalculus Practice Exams

Updated for the May 2027 AP[®] Exam Format

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Estimated scores in this book are for practice and progress tracking only. Official AP[®] score conversions vary from year to year.

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How to Use This Book

This book contains six original, full-length AP Precalculus practice exams written for the May 2027 exam format. The first five exams build toward more demanding practice, and Exam 6 is a balanced final rehearsal. Work through them in order:

Exam	Level	Purpose
1	Baseline	establish your starting point
2	Core Skills	secure the essential Unit 1–3 skills
3	Balanced	a realistic score projection
4	Threshold	longer reasoning chains
5	Challenge	the hardest questions in the book
6	Final Mock	a full exam-day rehearsal

Before each exam

Have pencils, a graphing calculator set to radian mode, and a timer ready. Work in a quiet place and plan for about three hours.

While you take it

Follow the exam timing exactly: Section I, Part A (65 minutes, no calculator), Part B (40 minutes, graphing calculator), then Section II, Part A (35 minutes, graphing calculator) and Part B (35 minutes, no calculator). Do not check answers or look ahead during the exam. Write your free-response work in the space below each question and on the extra page after Question 3; if you need more room, use additional paper, just as you would use the answer booklet on exam day.

After the exam

1. Check your multiple-choice answers with the answer key at the back of the book.
2. Score your free-response answers point by point with the scoring guides (scan the QR code on the answer page). The answer page also gives a short summary of the expected results.
3. Find your composite score and estimated AP score with the Score Guide, and record your results on the Report Sheet.
4. Review every question you missed or guessed with the fully worked solutions, and note the reason for each error.

What the exams cover

All questions are original and assess Units 1–3 of the AP Precalculus course: Polynomial and Rational Functions, Exponential and Logarithmic Functions, and Trigonometric and Polar Functions. (Unit 4 is not assessed on the AP Exam.)

The AP Precalculus Exam

May 2027 Format

The AP Precalculus Exam lasts 2 hours and 55 minutes and has two sections. It is a hybrid digital exam: multiple-choice questions are answered in the digital testing app, and free-response answers are handwritten in a paper booklet.

Section	Questions	Time	Calculator	Weight
I, Part A — Multiple choice	29	65 min	not permitted	43.75%
I, Part B — Multiple choice	13	40 min	graphing required	18.75%
II, Part A — Free response	2	35 min	graphing required	18.75%
II, Part B — Free response	2	35 min	not permitted	18.75%
Total	46	2 h 55 min		100%

The four free-response questions

Each free-response question is worth 6 points, and each one always assesses the same type of task:

FRQ	Task	Calculator
1	Function Concepts	graphing required
2	Modeling a Non-Periodic Context	graphing required
3	Modeling a Periodic Context	not permitted
4	Symbolic Manipulations	not permitted

Answer format

In calculator parts, give decimal answers accurate to three places after the decimal point unless a question says otherwise, and keep your calculator in radian mode. In free-response answers, show the work that leads to each answer; answers without supporting work may not earn full credit.

Scoring Your Practice Exams

Each part is weighted as on the AP Exam: Section I, Part A counts for 43.75%, Part B for 18.75%, and Section II for 37.5% of the composite score. Count your correct answers in Part A (questions 1–29) and Part B (questions 30–42) separately.

Section I, Part A score	$43.75 \times \frac{A}{29}$ (A = correct answers in questions 1–29)
Section I, Part B score	$18.75 \times \frac{B}{13}$ (B = correct answers in questions 30–42)
Section II score	$37.5 \times \frac{F}{24}$ (F = free-response points)
Composite score (0–100)	sum of the three scores

Round the composite score to the nearest whole number before using the table below.

Example: 21 correct answers in Part A, 9 in Part B, and 15 free-response points give $43.75 \times \frac{21}{29} + 18.75 \times \frac{9}{13} + 37.5 \times \frac{15}{24} \approx 31.68 + 12.98 + 23.44 = 68.10$, so the composite score is 68 (estimated AP score 4).

Composite score	Estimated AP score
70–100	5
57–69	4
43–56	3
30–42	2
0–29	1

These ranges are estimates for tracking your progress; official cutoffs are not published in advance and change from year to year. The online score calculator does the arithmetic for you and keeps a record of your attempts.

Score calculator



mathhigh.com/ap-precalculus-practice-exam-score-calculator

Practice Exam Report Sheet

Exam	Part A (/29)	Part B (/13)	FRQ (/24)	Composite (/100)	Est. AP score
1					
2					
3					
4					
5					
6					

Where did the points go? For each exam, count the questions you missed for each reason.

Reason	Exam 1	Exam 2	Exam 3	Exam 4	Exam 5	Exam 6
Concept						
Setup						
Algebra / arithmetic						
Justification (FRQ)						
Units / rounding						
Calculator use						
Time / strategy						

AP Precalculus — Practice Exam 1

~ Baseline AP Exam ~

How to Use This Exam

This exam establishes your starting point across the core skills of AP Precalculus (Units 1–3).

How to take it

Simulate a real exam day: correct timing, breaks, and calculator use.

Treat this exam as a full rehearsal of exam day.

Do not stop to check answers or redo questions.

What this exam measures

Foundational fluency across MCQ and FRQ

Comfort with the core Unit 1–3 skills

Readiness to move on to the harder practice exams

How to use your score

This exam gives your baseline practice score estimate.

Compare MCQ and FRQ performance separately.

Identify whether score loss comes from content gaps or execution errors.

This exam answers one question:

“Where am I starting from?”

“The only way to learn mathematics is to do mathematics.”

Paul R. Halmos

Section I, Part A

Time - 65 minutes, Number of questions - 29

NO CALCULATOR IS ALLOWED FOR THESE QUESTIONS

Solve each question. Unless otherwise stated, the domain of a function f is the set of all real numbers x for which $f(x)$ is a real number.

1. A company models its monthly profit, in thousands of dollars, by $P(x) = -2(x - 15)^2 + 120$, where x is the selling price in dollars. Which of the following statements is true?

- A) The maximum profit is \$15,000, occurring at a price of \$120.
- B) The maximum profit is \$120,000, occurring at a price of \$15.
- C) The profit increases without bound as the price increases.
- D) The maximum profit is \$120,000, occurring at a price of \$0.

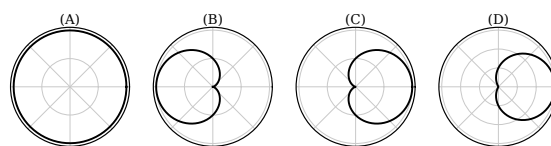
2. The functions are $g(x) = x^3 - x^2 - 6x$ and $h(x) = x^2 - 4$. Let $k(x) = \frac{h(x)}{g(x)}$. What is the domain of k ?

- A) all real numbers x
- B) all real numbers x where $x \neq -2, 2$
- C) all real numbers x where $x \neq -2, 0, 2, 3$
- D) all real numbers x where $x \neq -2, 0, 3$

3. What are all values of x for which $\log_{10} x + \log_{10}(x - 3) = 1$?

- A) $x = 5$ and $x = -2$
- B) $x = 5$
- C) $x = -2$
- D) $x = 13$

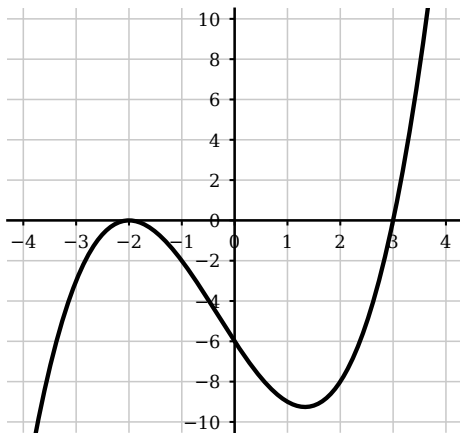
4. Which of the following is the graph of the polar function $r = 2 + 2 \cos \theta$ for $0 \leq \theta \leq 2\pi$?



- A) graph (A)
- B) graph (B)
- C) graph (C)
- D) graph (D)

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5. The graph of a polynomial function g is shown. Which of the following could be an expression for $g(x)$?



- A) $\frac{1}{2}(x-2)^2(x+3)$
 B) $\frac{1}{2}(x+2)(x-3)$
 C) $\frac{1}{2}(x+2)(x-3)^2$
 D) $\frac{1}{2}(x+2)^2(x-3)$

6. The polynomial function p is given by $p(x) = -2x^4 + x^3 + 3$. Which of the following describes the end behavior of p ?

- A) $\lim_{x \rightarrow -\infty} p(x) = \infty$ and $\lim_{x \rightarrow \infty} p(x) = \infty$
 B) $\lim_{x \rightarrow -\infty} p(x) = -\infty$ and $\lim_{x \rightarrow \infty} p(x) = -\infty$
 C) $\lim_{x \rightarrow -\infty} p(x) = -\infty$ and $\lim_{x \rightarrow \infty} p(x) = \infty$
 D) $\lim_{x \rightarrow -\infty} p(x) = \infty$ and $\lim_{x \rightarrow \infty} p(x) = -\infty$

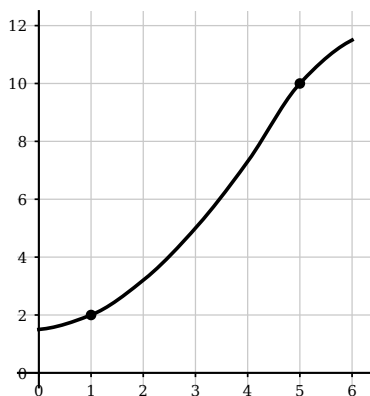
7. A quantity is initially 200 and increases by 3% each month. If t is measured in years, which of the following models the amount $M(t)$?

- A) $M(t) = 200(0.03)^{12t}$
 B) $M(t) = 200(1.03)^{t/12}$
 C) $M(t) = 200(1.03)^{12t}$
 D) $M(t) = 200(1.36)^t$

8. What is the exact value of $\cos \frac{5\pi}{6}$?

- A) $-\frac{1}{2}$
- B) $\frac{\sqrt{3}}{2}$
- C) $\frac{1}{2}$
- D) $-\frac{\sqrt{3}}{2}$

9. The graph of a function f is shown. What is the average rate of change of f over the interval $[1, 5]$?

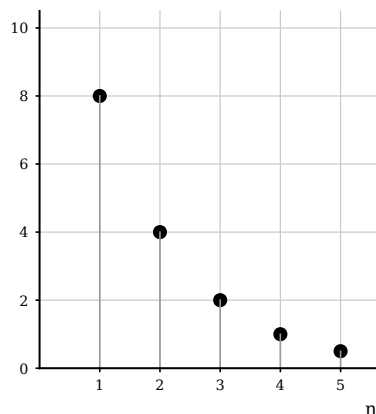


- A) 2
- B) 8
- C) 4
- D) 12

10. The function p is an odd function. If $p(2) = 5$ is a relative maximum of p , which of the following about $p(-2)$ must be true?

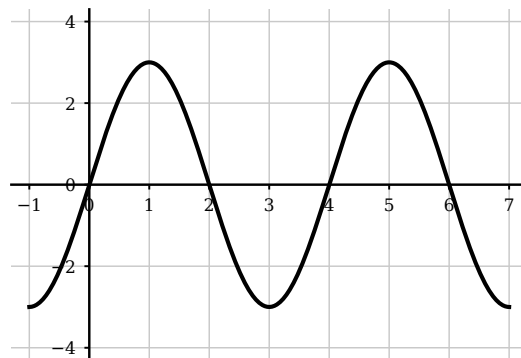
- A) $p(-2) = -5$ is a relative minimum.
- B) $p(-2) = 5$ is a relative maximum.
- C) $p(-2) = 5$ is a relative minimum.
- D) $p(-2) = -5$ is a relative maximum.

11. The terms of a geometric sequence g_n are graphed. Which of the following is an expression for the n th term of the sequence?



- A) $g_n = 8\left(\frac{1}{2}\right)^n$
 B) $g_n = \frac{1}{2}(8)^{n-1}$
 C) $g_n = 8\left(\frac{1}{2}\right)^{n-1}$
 D) $g_n = 8(2)^{n-1}$

12. The figure shows the graph of a sinusoidal function. What are the amplitude and period of the function?



- A) amplitude 3, period 4
 B) amplitude 6, period 4
 C) amplitude 3, period 2
 D) amplitude 6, period 8

13. The table gives values of a function f .

x	-4	-2	0	2	4	6	8
$f(x)$	1	3	5	6	9	2	-3

Let $g(x) = 2f\left(\frac{x}{2}\right) + 1$. What is the value of $g(4)$?

- A) 13
 B) -5
 C) 12
 D) 7

14. Which of the following functions has a zero at $x = 4$, a vertical asymptote at $x = 3$, and a hole at $x = 1$?

- A) $\frac{(x-3)(x-1)}{(x-4)(x-1)}$
- B) $\frac{(x-4)(x-3)}{(x-1)(x-3)}$
- C) $\frac{(x-4)(x-1)}{(x-3)(x-1)}$
- D) $\frac{(x-1)(x-4)}{(x-3)(x-4)}$

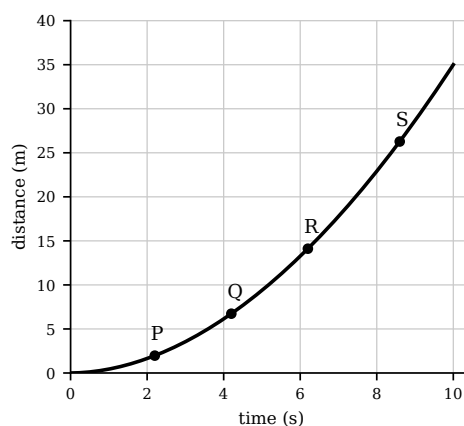
15. Let x be a positive constant. Which of the following is equivalent to $2\log x - \log(x+1) + \log 3$?

- A) $\log\left(\frac{x^2}{3(x+1)}\right)$
- B) $\log\left(\frac{3x^2}{x+1}\right)$
- C) $\log\left(\frac{6x}{x+1}\right)$
- D) $\log(3x^2(x+1))$

16. What are all values of x , $0 \leq x < 2\pi$, for which $\sin x > \frac{1}{2}$?

- A) $\left(\frac{\pi}{3}, \frac{2\pi}{3}\right)$
- B) $\left(\frac{\pi}{6}, \frac{5\pi}{6}\right)$
- C) $\left(0, \frac{\pi}{6}\right) \cup \left(\frac{5\pi}{6}, 2\pi\right)$
- D) $\left(\frac{5\pi}{6}, \frac{7\pi}{6}\right)$

17. The graph shows the distance traveled by a car over time. At which of the labeled points is the car moving at the greatest speed?



- A) point P
- B) point Q
- C) point R
- D) point S

18. The table gives values of a function f defined for all real numbers.

x	-2	-1	0	1	2
$f(x)$	5	2	0	-2	-5

The table is consistent with f being which of the following?

- A) an even function
- B) neither even nor odd
- C) an odd function
- D) both even and odd

19. The table gives values of a function g , and f is given by $f(x) = x^2 - 1$.

x	0	1	2	3	4
$g(x)$	2	4	1	0	3

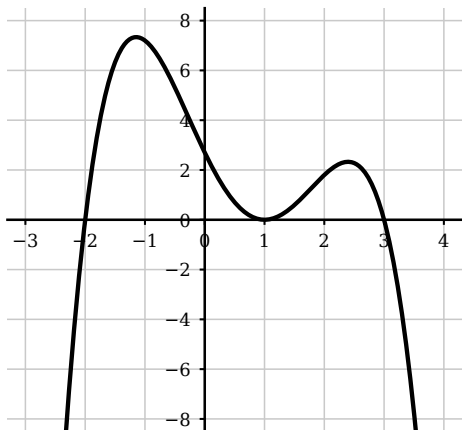
What is the value of $f(g(3))$?

- A) 8
- B) 15
- C) 0
- D) -1

20. What are all values of x , $0 \leq x < 2\pi$, for which $2 \sec x = -4$?

- A) $x = \frac{2\pi}{3}, \frac{4\pi}{3}$
- B) $x = \frac{\pi}{3}, \frac{5\pi}{3}$
- C) $x = \frac{\pi}{6}, \frac{11\pi}{6}$
- D) $x = \frac{5\pi}{6}, \frac{7\pi}{6}$

21. The graph of a polynomial function f is shown. At which zero does the graph of f touch the x -axis but not cross it?



- A) $x = 1$
- B) $x = -2$
- C) $x = 0$
- D) $x = 3$

22. The table gives values of a one-to-one function f .

x	1	2	3	4	5
$f(x)$	3	7	10	15	22

What is the value of $f^{-1}(10)$?

- A) 22
- B) 15
- C) 7
- D) 3

23. The table gives values of a function.

x	0	1	2	3
y	3	6	12	24

Which of the following best models the data?

- A) Linear, because y changes by a constant amount.
- B) Exponential, because y changes by a constant ratio.
- C) Linear, because y increases over each interval.
- D) Exponential, because y changes by a constant amount.

24. On a Ferris wheel, a rider's height above the ground, in feet, varies sinusoidally with time. The maximum height is 46 feet and the minimum height is 6 feet. What are the midline and amplitude of this sinusoidal function?

- A) midline 40, amplitude 20
- B) midline 20, amplitude 26
- C) midline 26, amplitude 20
- D) midline 26, amplitude 40

25. The function f is given by $f(x) = 2^{x-1} + 3$. Which of the following is $f^{-1}(x)$?

- A) $3 + \log_2(x - 1)$
- B) $1 + \log_2 x - 3$
- C) $1 + \log_2(x - 3)$
- D) $\log_2(x - 3) - 1$

26. How many solutions does the equation $2\cos^2 x - 1 = 0$ have on the interval $0 \leq x < 2\pi$?

- A) 2
- B) 4
- C) 3
- D) 1

27. In a geometric sequence, $g_2 = 6$ and $g_4 = 24$. Which of the following could be the value of g_5 ?

- A) either 48 or -48
- B) 48 only
- C) -48 only
- D) 96

28. A polar function $r = f(\theta)$ is negative and increasing on an interval of θ . On this interval, the distance between the point $(f(\theta), \theta)$ and the origin is

- A) decreasing
- B) increasing
- C) constant
- D) zero throughout

29. What is the value of x for which $9^x = 27^{x-1}$?

- A) $x = -1$
- B) $x = 1$
- C) $x = \frac{3}{5}$
- D) $x = 3$

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Section I, Part B

Time - 40 minutes, Number of questions - 13

A GRAPHING CALCULATOR IS REQUIRED FOR THESE QUESTIONS

A graphing calculator is required. Unless otherwise indicated, angle measures are in radians and answers should be given to the accuracy specified in each question. The domain of a function f is the set of all real numbers x for which $f(x)$ is a real number.

30. A car purchased for \$28,000 loses value according to $V(t) = 28000(0.88)^t$ dollars after t years. To the nearest tenth of a year, when is the car worth \$15,000?

A) 4.9
B) 5.5
C) 0.3
D) 3.5

31. On a Ferris wheel, a rider's height above the ground is modeled by $h(t) = 25 \sin(0.25(t - 3)) + 30$ feet, where t is in seconds and the argument is in radians. To the nearest tenth of a foot, what is the rider's height at $t = 10$ seconds?

A) 30.8
B) 24.6
C) 43.5
D) 54.6

32. An open box is made from a 24-inch by 18-inch sheet of cardboard by cutting congruent squares of side x from each corner and folding up the sides. The volume is $V(x) = x(24 - 2x)(18 - 2x)$. To the nearest hundredth, what value of x maximizes the volume?

A) 10.61
B) 7.00
C) 3.39
D) 9.00

33. The table shows data for a quantity y at times x .

x	1	2	3	4	5
y	54	69	89	113	145

An exponential regression gives the model $y = 42.3(1.28)^x$. To the nearest whole number, what does the model predict for $x = 10$?

A) 423
B) 55
C) 550
D) 499

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34. What is the smallest positive solution, in radians, to $4\cos x = 1.5$? Round to the nearest hundredth.

- A) 0.38
- B) 1.95
- C) 1.19
- D) 5.09

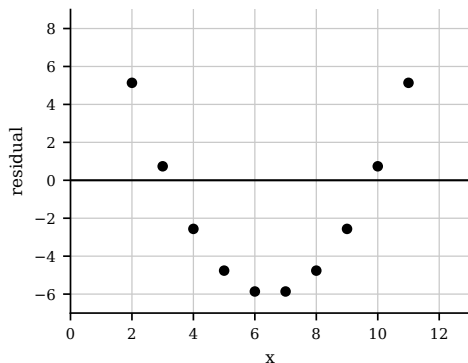
35. The functions are $f(x) = x^3 - 2x$ and $g(x) = 5 - x^2$. For how many values of x does $f(x) = g(x)$?

- A) 0
- B) 1
- C) 2
- D) 3

36. The depth of water at a dock is modeled by $d(t) = 4.2\sin(0.51t) + 6.8$ meters, where t is measured in hours and the argument of the sine function is in radians. To the nearest hundredth of an hour, at what time does the depth first reach 9 meters?

- A) 0.55
- B) 1.08
- C) 2.20
- D) 3.02

37. A linear model is fit to a bivariate data set, and the residual plot is shown. What does the residual plot suggest?



- A) The linear model is not appropriate; a nonlinear model should be considered.
- B) The linear model is appropriate for the data.
- C) The two variables have no association.
- D) The residuals are randomly distributed.

38. The function f is given by $f(x) = \frac{x^2}{x+1}$. To the nearest hundredth, what is the average rate of change of f over the interval $[2, 6]$?

- A) 0.95
- B) 3.81
- C) 5.14
- D) 1.33

39. For the polar function $r = 4 - 3 \cos \theta$, what is the value of r when $\theta = 2.5$ radians? Round to the nearest hundredth.

- A) 1.00
- B) 1.60
- C) 8.40
- D) 6.40

40. The sound intensity level, in decibels, is $L = 10 \log \left(\frac{I}{I_0} \right)$. A jet engine measures 95 decibels. To two significant figures, what is the ratio $\frac{I}{I_0}$?

- A) 9.5
- B) 3.2×10^9
- C) 1.3×10^4
- D) 3.2×10^{10}

41. A wheelchair ramp rises 5 feet over a horizontal run of 12 feet. To the nearest degree, what is the angle of elevation of the ramp?

- A) 23°
- B) 45°
- C) 67°
- D) 25°

42. A sinusoidal regression on daylight-hours data gives $D(t) = 3.1 \sin(0.017t - 1.4) + 12.2$ hours, where t is the day of the year and the argument of the sine function is in radians. To the nearest tenth of an hour, how many hours of daylight does the model predict on day $t = 100$?

- A) 12.2
- B) 15.3
- C) 13.1
- D) 11.3

Section II, Part A

Time - 35 minutes, Number of questions - 2

A GRAPHING CALCULATOR IS REQUIRED FOR THESE QUESTIONS

Show all work. Unless otherwise specified, decimal approximations should be accurate to three places after the decimal point, and the domain of a function f is the set of all real numbers x for which $f(x)$ is a real number. Make sure your calculator is in radian mode.

1. The function f is defined for all real numbers. The table gives values of $f(x)$ at selected values of x . The function g is given by $g(x) = 5(0.8)^x$.

x	-1	0	1	2	3
$f(x)$	0	3	4	3	0

(A)

- (i) The function h is defined by $h(x) = (g \circ f)(x) = g(f(x))$. Find the value of $h(2)$ as a decimal approximation, or indicate that it is not defined.
- (ii) Find all values of x shown in the table for which $f(x) = 3$, or indicate that there are no such values.

(B)

- (i) Find all values of x , as decimal approximations, for which $g(x) = 2$, or indicate that there are no such values.
- (ii) Determine the end behavior of g as x increases without bound. Express your answer using the mathematical notation of a limit.

(C)

- (i) Does f have an inverse function?
- (ii) Give a reason for your answer based on whether f is one-to-one. Refer to values in the table.

2. A biologist starts a bacteria culture at time $t = 0$ hours; the model below is valid for $t \geq 0$. At time $t = 1$ hour, the culture contains 300 cells. At time $t = 4$ hours, the culture contains 2400 cells. The number of cells in the culture can be modeled by the function P given by $P(t) = a \cdot b^t$, where $P(t)$ is the number of cells and t is the number of hours since the culture was started.

(A)

- (i) Use the given data to write two equations that can be used to find the values of the constants a and b .
- (ii) Find the values of a and b .

(B)

- (i) Use the given data to find the average rate of change of the number of cells, in cells per hour, from $t = 1$ to $t = 4$ hours. Show the computations that lead to your answer.
- (ii) Using correct units, interpret the meaning of the value found in part (i) in the context of the problem.

(C)

- (i) When the culture reaches 10,000 cells, the biologist ends the experiment. Write and solve an equation to determine the time t at which the culture reaches 10,000 cells. Express your answer as a decimal approximation.
- (ii) Explain how the result from part (i) can be used to determine an appropriate restriction on the domain of the model P .

END OF PART A OF SECTION II

Section II, Part B

Time - 35 minutes, Number of questions - 2

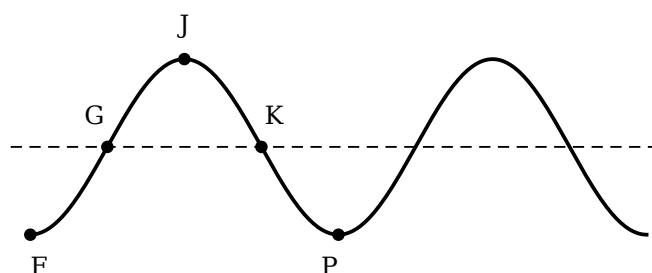
NO CALCULATOR IS ALLOWED FOR THESE QUESTIONS

Show all work. Unless otherwise specified, the domain of a function f is the set of all real numbers x for which $f(x)$ is a real number, and angle measures for trigonometric functions are in radians.

3. A Ferris wheel rotates at a constant rate and completes one full revolution every 80 seconds. The radius of the wheel is 19 meters. At time $t = 0$ seconds, a rider is at the lowest point of the wheel, 19 meters below the center. As the wheel turns, the rider's height above the center of the wheel periodically increases and decreases.

The sinusoidal function h models the height of the rider above the center of the wheel, in meters, as a function of time t , in seconds. A positive value of $h(t)$ indicates the rider is above the center; a negative value indicates the rider is below the center.

(A) The graph of h and its dashed midline for two full cycles is shown. Five points — F , G , J , K , and P — are labeled on the graph. No scale is indicated, and no axes are presented. Determine possible coordinates $(t, h(t))$ for the five points: F , G , J , K , and P .



(B) The function h can be written in the form $h(t) = a \sin(b(t + c)) + d$. Find possible values of the constants a , b , c , and d .

(C) Refer to the graph of h in part (A). The t -coordinate of J is t_1 , and the t -coordinate of K is t_2 .

- (i) On the interval (t_1, t_2) , which of the following is true about h ?
(a) h is positive and increasing. (b) h is positive and decreasing.
(c) h is negative and increasing. (d) h is negative and decreasing.
- (ii) On the interval (t_1, t_2) , describe the concavity of the graph of h and determine whether the rate of change of h is increasing or decreasing.

Use this page for your work on Question 3.

4. *Directions:* Determine the exact value of any expression that can be obtained without a calculator. Combine terms using algebraic methods and rules for exponents and logarithms where applicable. For each part, show the work that leads to your answer.

(A) The functions g and h are given by

$$g(x) = \log_2(x - 1) + 3, \quad h(x) = 2 \sin x.$$

- (i) Solve $g(x) = 5$ for values of x in the domain of g .
- (ii) Solve $h(x) = 1$ for values of x in the interval $[0, 2\pi)$.

(B) The functions j and k are given by

$$j(x) = \log_2(16x^5) - \log_2(2x^2), \quad k(x) = \frac{\sec x - \cos x}{\tan x}.$$

- (i) Rewrite $j(x)$ as a single logarithm base 2 of the form $\log_2(\text{expression})$.
- (ii) For all x in the domain of k , rewrite $k(x)$ as a single term involving $\sin x$ and no other trigonometric functions.

(C) The function m is given by $m(x) = e^{2x} - 4e^x + 3$. Find all values in the domain of m that yield an output value of 0.

END OF PART B OF SECTION II

Practice Exam 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14
B	D	B	C	D	B	C	D	A	A	C	A	A	C
15	16	17	18	19	20	21	22	23	24	25	26	27	28
B	B	D	C	D	A	A	D	B	C	C	B	A	A
29	30	31	32	33	34	35	36	37	38	39	40	41	42
D	A	D	C	D	C	B	B	A	A	D	B	A	C

FRQ

Scan for solutions



Question 1

- (A) (i) $h(2) = 2.560$ (ii) $x = 0, 2$
 (B) (i) $x \approx 4.106$ (ii) $\lim_{x \rightarrow \infty} g(x) = 0$
 (C) (i) No (ii) $f(0) = f(2) = 3$, so f is not one-to-one.

Scoring Breakdown:

2 - 2 - 2 (Total 6 points)

Question 2

- (A) (i) $300 = ab$, $2400 = ab^4$ (ii) $a = 150$, $b = 2$
 (B) (i) 700 cells per hour (ii) From $t = 1$ to $t = 4$, the culture grew at an average rate of 700 cells per hour.
 (C) (i) $t \approx 6.059$ (ii) $0 \leq t \leq 6.059$

Scoring Breakdown:

2 - 2 - 2 (Total 6 points)

Question 3

- (A) $F(0, -19)$, $G(20, 0)$, $J(40, 19)$, $K(60, 0)$, $P(80, -19)$
 (B) $a = 19$, $b = \frac{\pi}{40}$, $c = -20$, $d = 0$
 (C) (i) (b) positive and decreasing (ii) concave down; rate of change decreasing

Scoring Breakdown:

2 - 2 - 2 (Total 6 points)

Question 4

- (A) (i) $x = 5$ (ii) $x = \frac{\pi}{6}, \frac{5\pi}{6}$
 (B) (i) $\log_2(8x^3)$ (ii) $\sin x$
 (C) $x = 0$, $x = \ln 3$

Scoring Breakdown:

2 - 2 - 2 (Total 6 points)

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