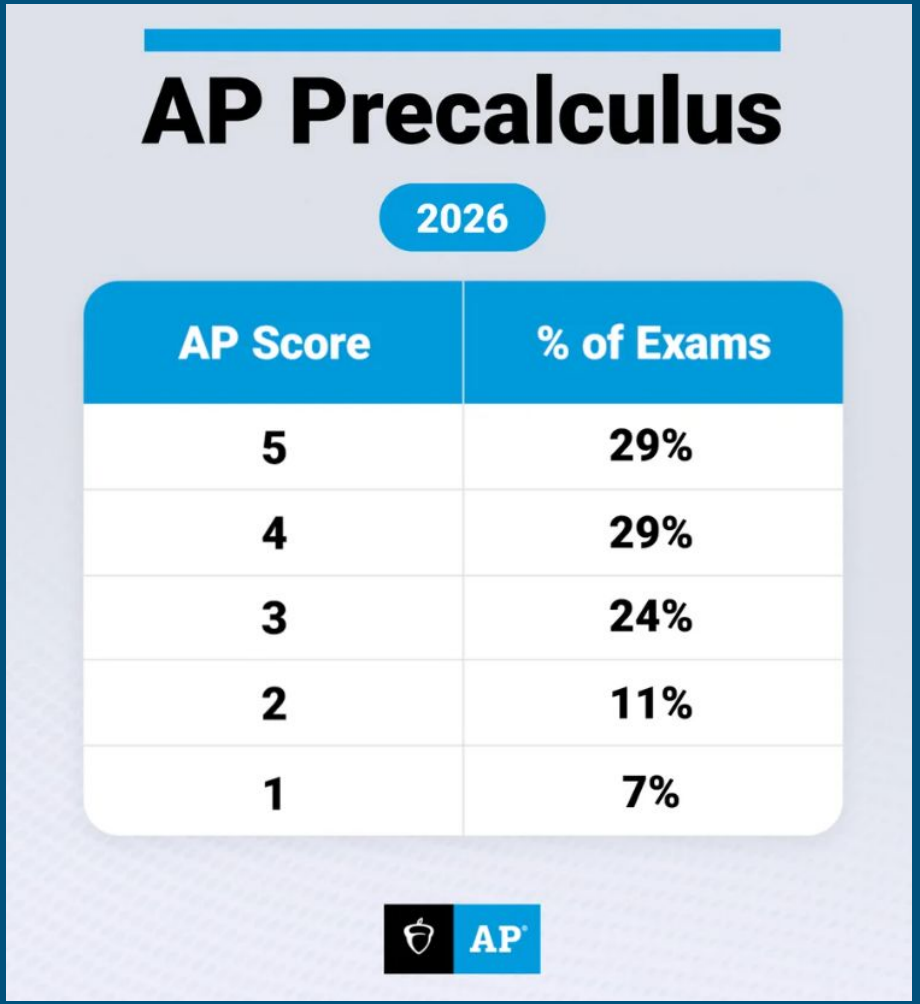
2026 AP Precalculus Reading Review

GAAPMT at Rock Eagle
Julie Harrison

Items of Interest

- Growth: 2024 — approximately 187,000
  2025 — approximately 257,000
  2026 — approximately 302,000
- Largest Math Exam by Volume
- 767 Participants at the AP Reading to get the job done :)

Score Distribution



Exam Changes for 2027



42 **Multiple-Choice** questions

- Part A: 29 questions, 1 hour and 5 minutes (No calculator allowed)
- Part B: 13 questions, 40 minutes (Graphing calculator required)



4 **Free-Response** questions

- Part A: 2 questions, 35 minutes (Graphing calculator required)
- Part B: 2 questions, 35 minutes (No calculator allowed)
- Note: Updates to FRQ 2. Part B (iii) removed. Part C modified to have two parts.

Course and Exam Description Changes

- Revision to multiple Essential Knowledge Statements (updated CED)
- Clarifications Document indicates the specific change within each

- **EK 1.1.A.2**
  Updated to read, "The input and output values of a function vary in tandem according to the *function rule*, which can be expressed graphically, numerically, analytically, or verbally. **The *image of an input value* is the single output value yielded by the function rule. The *preimage of an output value* is the set of input values for which the function rule yields that output value."**

Course and Exam Description Changes

- **EK 2.6.B.1**
  Updated to read, "For a given value of an independent variable, a *residual* of a regression is the actual value of the dependent variable value minus the value predicted by the function regression model. A *residual plot* is a graphical representation of the residuals of a regression, with the residuals on the vertical axis and the independent variable on the horizontal axis. A model is justified as *appropriate* for a data set if the residual plot appears without pattern."
- **EK 2.6.B.2**
  Updated to read, "For given values of an independent variable, the *errors* in a model can relate to the signed differences in the values of the dependent variable predicted by the function regression model and the actual values OR the unsigned absolute values of the residuals. Errors may reveal that the model underestimates or overestimates actual values on a given input-value interval. The data set and context can provide clues as to whether underestimates or overestimates are preferred on a given input-value interval."

Course and Exam Description Changes

- **EK 3.4.A.2**
  Clarified to read, "As the input values, or angle measures, of the sine function increase, the output values oscillate between -1 and 1, taking every value in between and tracking the vertical **displacement** of points on the unit circle from the *x*-axis."
- **EK 3.4.A.4**
  Clarified to read, "As the input values, or angle measures, of the cosine function increase, the output values oscillate between -1 and 1, taking every value in between and tracking the horizontal **displacement** of points on the unit circle from the *y*-axis."

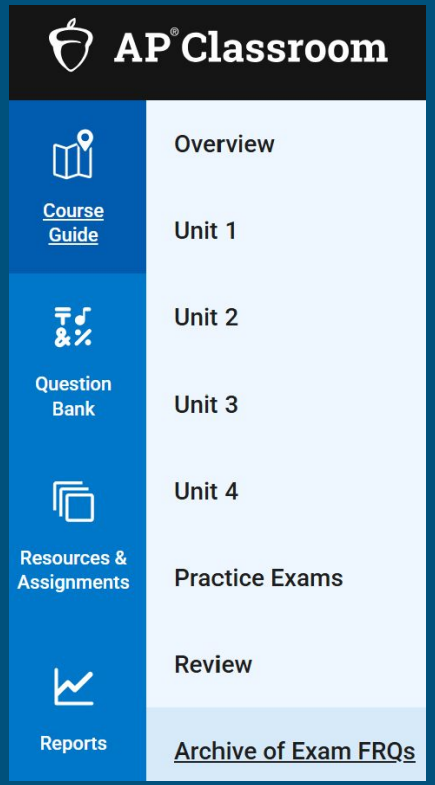
Items of Interest

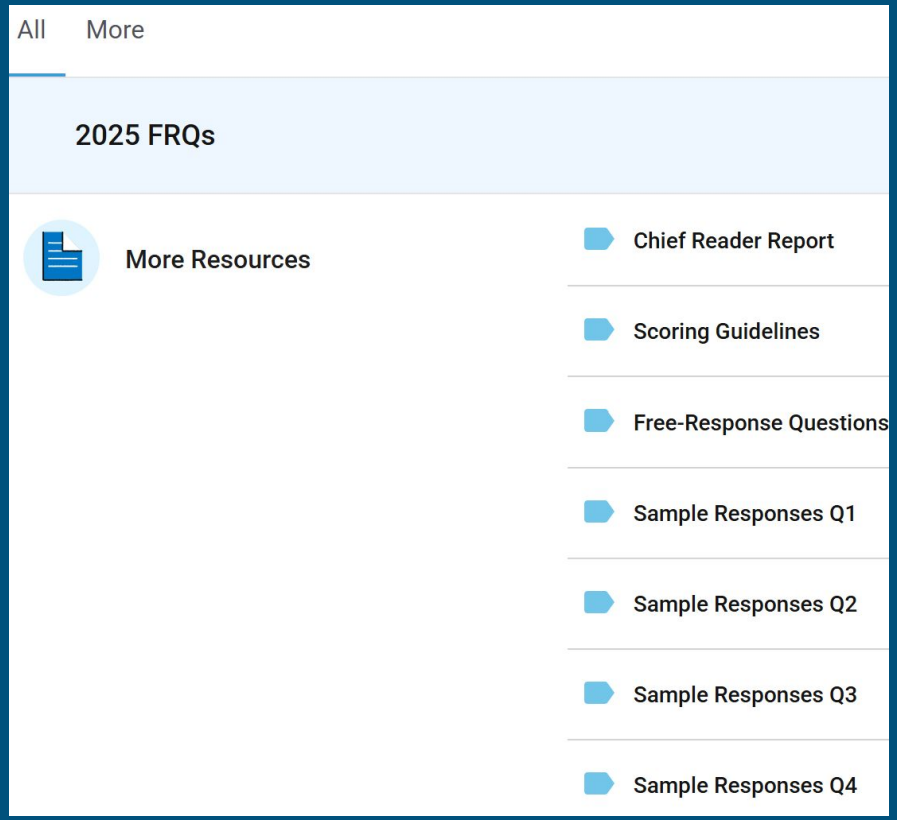
- Students in 2026 demonstrated higher content mastery than in 2024 and 2025
- Over a 6-percentage point increase in score of 3+ from 2024 to 2026
- Continue using the AP Desmos Version with your students
- Only 37.5% of exam score is calculator active
- Release of administered questions — now in early June

Items to Note

- Apply to be an AP Reader.
- Look deeply at the 2026 Scoring Notes and Student Samples.
- Stay plugged in: Online Community, Facebook Group, AP Offerings, Fellow Educators, etc.
- Have your students using AP Classroom regularly.
- New Practice Exam Likely (Q1 of 2027?)

Location


AP® Classroom
Course Guide
Question Bank
Resources & Assignments
Reports
Overview
Unit 1
Unit 2
Unit 3
Unit 4
Practice Exams
Review
Archive of Exam FRQs


All
More
2025 FRQs
More Resources
Chief Reader Report
Scoring Guidelines
Free-Response Questions
Sample Responses Q1
Sample Responses Q2
Sample Responses Q3
Sample Responses Q4

From Trevor Packer's Summer Post on X (MC)

- Students generally scored higher on questions about exponential and logarithmic function than other types (polynomial, rational, trigonometric, and polar)
- Students performed especially well on questions requiring them to deploy skill of supporting conclusions with a logical rationale (3.C)
- Students earning 3s were also able to answer most of rationale questions correctly
- Exciting since one focus area of course is helping students develop the ability to communicate with precise language and provide rationales

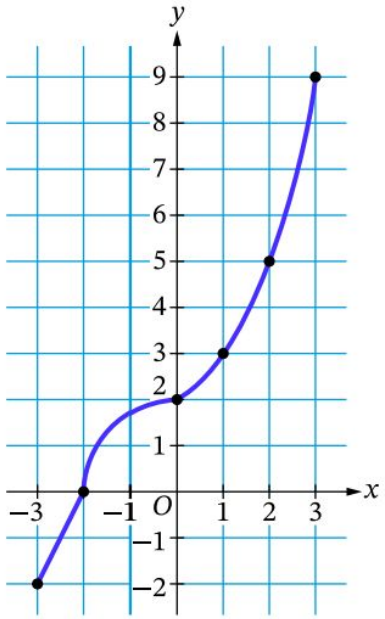
From Trevor Packer's Summer Post on X (FRQ)

- FRQ #1: Students earning 1s typically earned no points. This question differentiated performance across the scores of 2 - 5.
- FRQ #2: Students earning 1s and 2s typically were unable to engage with the rigor of this question.
- FRQ #3: Overall students scored highest on this question. Students receiving 2s could typically only perform one of the tasks in the question.
- FRQ #4: The breadth of demands made this the most challenging and an excellent measure of overall precalculus mastery among the top students. Opportunities for 5s to distinguish themselves from 4s.

Let’s dive into the question specifics…

Free Response #1 – Function Concepts

The figure shows the graph of the increasing function f on its domain of $-3 \le x \le 3$.



Graph of f

The function g is given by $g(x) = -4.792 + \ln(6x - 6)$.

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. Show the work that leads to your answer.

ii. Find all values of x 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 $g(x) = -1.5$, or indicate that there are no such values.

ii. Determine the behavior of g as x-values decrease and get arbitrarily close to 1. Express your answer using the mathematical notation of a limit.

C.

i. Is the function f invertible?

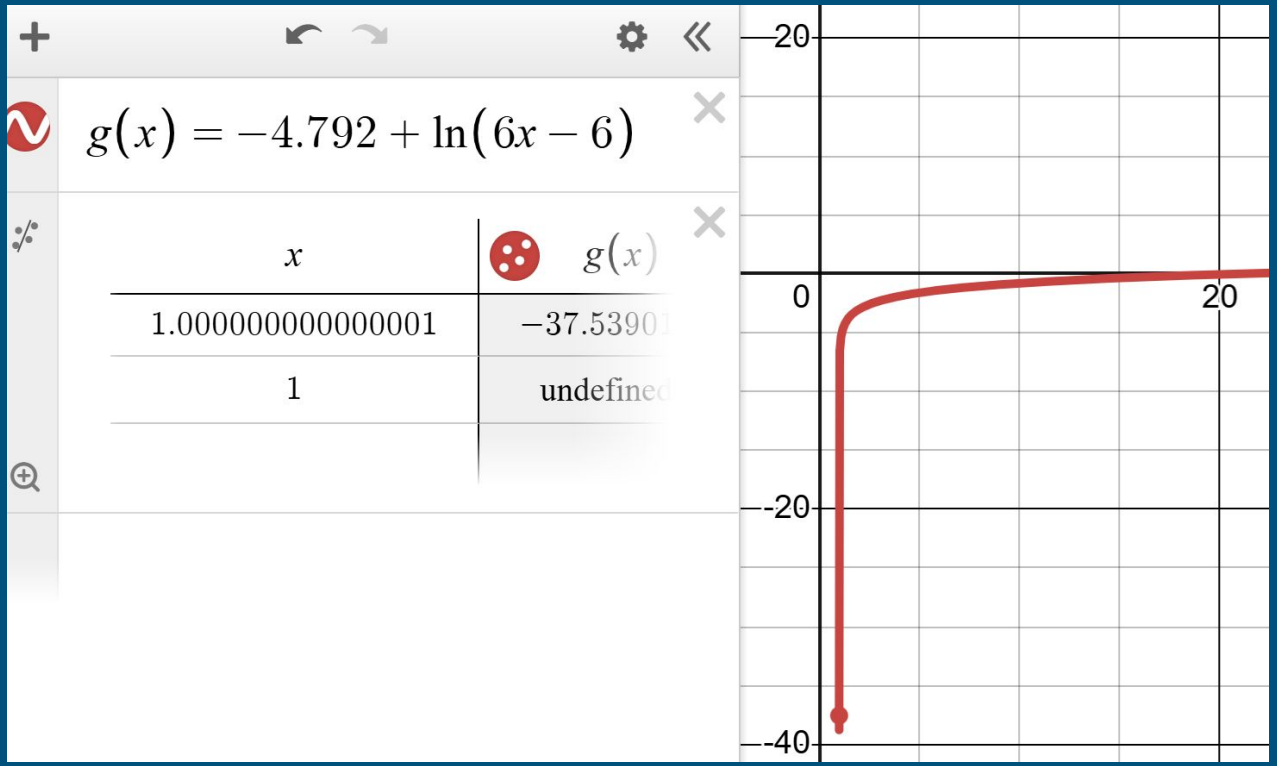
ii. Give a reason for your answer in part C (i) based on properties of the function f. Refer to points on the graph of f in your reasoning.

Free Response #1

	2024 Performance (2.95)	2025 Performance (3.5)	2026 Performance (3.37)
Point A1	0.63	0.6	0.68
Point A2	0.61	0.7	0.77
Point B1	0.51	0.6	0.61
Point B2	0.48	0.6	0.13
Point C1	0.59	0.7	0.85
Point C2	0.15	0.3	0.33

Free Response #1

The function g is given by $g(x) = -4.792 + \ln(6x - 6)$.



Free Response #1 – Strengths and Errors

- Strengths
  - Understanding function notation and composition
  - Understanding solving an equation with technology
  - Determining that a function is invertible

- Errors
  - Not presenting a decimal answer accurate to three places
  - Mishandling the one-sided nature of the limit
  - Justifying invertibility with implications that each input maps to a unique output

Free Response #1 – Student Needs

- Practice distinguishing between inputs and outputs
- Fluency with writing limits involving inputs increasing (decreasing) and getting arbitrarily close to a given value
- Practice writing clear explanations and communicating reasoning
- Awareness that decimal approximations should be accurate to three places after the decimal point
- Practice describing invertibility using the language of inputs and outputs

Free Response #2 – Modeling a Non-Periodic Context

2. A person purchased a car at the end of the year 2019 ($t = 0$). The car's value decreases over time. At the end of the year 2020 ($t = 1$), the car was valued at 27.2 thousand dollars. At the end of the year 2025 ($t = 6$), the car was valued at 14.8 thousand dollars.

The value of the car can be modeled by the function V given by $V(t) = ab^t$, where $V(t)$ is the value of the car, in thousands of dollars, at time t, and t is the number of years since the end of 2019.

A.

i. Use the given data to write two equations that can be used to find the values for constants a and b in the expression for $V(t)$.

ii. Find the values for a and b as decimal approximations.

B.

i. Use the given data to find the average rate of change of the value of the car, in thousands of dollars per year, from $t = 1$ to $t = 6$ years. Express your answer as a decimal approximation. Show the computations that lead to your answer.

ii. Use the average rate of change found in part B (i) to estimate the value of the car, in thousands of dollars, at $t = 3$ years. Show the work that leads to your answer.

iii. The average rate of change found in part B (i) can be used to determine the secant line for the graph of V on the interval $1 \le t \le 6$. Let $A(t)$ represent the estimate of the value of the car, in thousands of dollars, at time t years, using the secant line. For $A(3)$, found in part B (ii), it can be shown that $A(3) > V(3)$.

In general, $A(t) > V(t)$ for all t, where $1 < t < 6$. Use the secant line and the graph of V to explain why this is true.

C. When the value of the car reaches 2 thousand dollars, the car's owner plans to donate it to an auto mechanic school. As a result, the car will immediately lose all of its value. Explain how this information can be used to determine a domain limitation for the model V.

Free Response #2

	2024 Performance (2.03)	2025 Performance (2.2)	2026 Performance (2.65)
Point A1	0.58	0.5	0.65
Point A2	0.36	0.5	0.50
Point B1	0.58	0.6	0.66
Point B2	0.39	0.4	0.43
Point B3	0.04	0.1	0.14
Point C1	0.08	0.1	0.28

Free Response #2 – Strengths and Errors

- Strengths
  - Responses with correct equations could solve for a and b
  - Providing correct supporting work for the average rate of change and correct decimal approximations
- Errors
  - Using a prematurely rounded b-value leading to an incorrect a-value
  - Use of model V to find the value at t = 3 instead of secant line
  - Using nonstandard abbreviations (CCU) that were ambiguous
  - Difficulty using specifics of the context and the model to provide the upper bound for the domain of the model

Free Response #2 – Student Needs

- Practice writing clear explanations without abbreviations
- Practice using technology to store/save information instead of rounding in intermediate steps
- Practice labeling any sketches used with an explanation with relevant features
- Experimentation with premature rounding issues
- Practice using the language in the Course Framework

Adaptation of 2026 Free Response Question Part C to illustrate 2027 changes

When the value of the car reaches 2 thousand dollars, the car's owner plans to donate it to an auto mechanic school. As a result, the car will immediately lose all of its value. Use model V to respond to the following.

i. Write and solve an equation whose solution gives the time t, in number of years since 2019, when the car reaches a value of 2 thousand dollars. Express your value for t as a decimal approximation.

ii. Explain how the value for t found in part C (i) can be used to determine an appropriate domain restriction for the model V. Refer to the context of the question in your explanation.

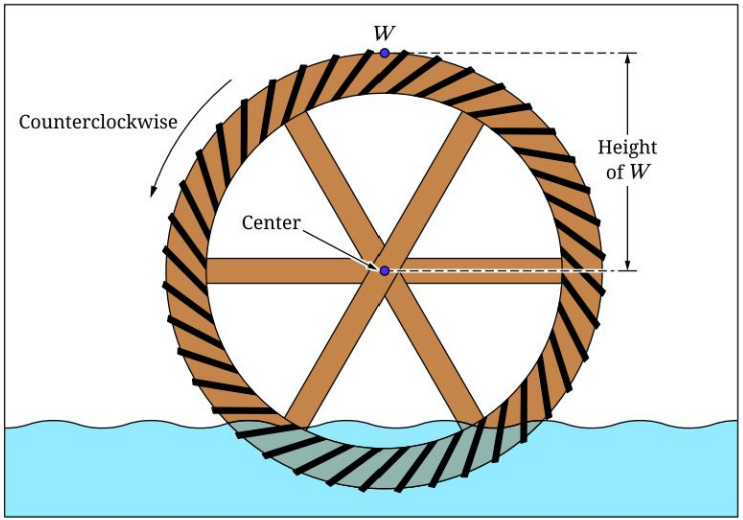
What could a model answer look like?

i. $2 = 30.7206(0.8854)^t$
$t = 22.444$ years

ii. Since the car will lose all of its value when the car's value reaches 2 thousand dollars, the model V will no longer be valid for times beyond 22.444 years. Finding this value provides an appropriate domain restriction for the model.

Free Response #3 – Modeling a Periodic Context

3. The figure shows a circular waterwheel that rotates in a counterclockwise direction at a constant rate and completes 1 revolution in 10 seconds. At time $t = 0$, point W on the edge of the waterwheel is at a height of 6 feet directly above the center of the waterwheel. The height of point W from the horizontal line through the center of the waterwheel periodically decreases and increases as the waterwheel moves.

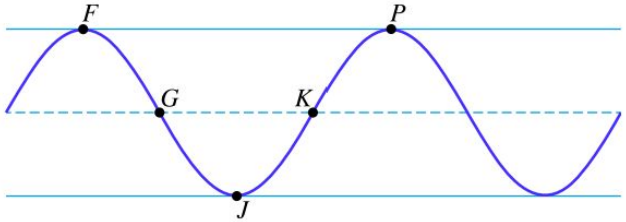


Note: Figure not drawn to scale.

The sinusoidal function h models the height of point W from the horizontal line through the center of the waterwheel, in feet, as a function of time t, in seconds. A positive value of $h(t)$ indicates W is above the line through the center; a negative value of $h(t)$ indicates W is below the line through 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 values of 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.

Free Response #3

	2024 Performance (2.96)	2025 Performance (3.1)	2026 Performance (3.63)
Point A1	0.71	0.8	0.65
Point A2	0.39	0.3	0.61
Point B1	0.60	0.7	0.67
Point B2	0.20	0.2	0.29
Point C1	0.68	0.7	0.66
Point C2	0.38	0.5	0.76

Free Response #3 – Strengths and Errors

- Strengths
  - Identification of the height of the point on the wheel
  - Responses earning point for h(t)-coordinates were successful identifying values of a and d
  - Identification of the correct behavior of h on the interval
- Errors
  - Difficulty placing the midline of the vertical position at h(t)=0
  - Difficulty translating period and phase shift in context to give constants b and c
  - Difficulty clearly describing the behavior of the rate of change of h

Free Response #3 – Student Needs

- Practice contextual scenarios throughout the course
- Practice sketching and labeling a sinusoid with negative outputs
- Practice expressing a model using both sine and cosine
- Practice producing sinusoid labels for multiple cycles and when t = 0 does not correspond to the initial maximum (point F)
- Practice identifying constants b and c
- Practice precise descriptions related to concavity throughout the course

Free Response #4 Directions

Directions:

- Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number. Angle measures for trigonometric functions are assumed to be in radians.
- Solutions to equations must be real numbers. Determine the exact value of any expression that can be obtained without a calculator. For example, $\log_2 8$, $\cos\left(\frac{\pi}{2}\right)$, and $\sin^{-1}(1)$ can be evaluated without a calculator.
- Unless otherwise specified, combine terms using algebraic methods and rules for exponents and logarithms, where applicable. For example, $2x+3x$, $5^2 \cdot 5^3$, $\frac{x^5}{x^2}$, and $\ln 3 + \ln 5$ should be rewritten in equivalent forms.
- For each part of the question, show the work that leads to your answers.

Free Response #4 – Symbolic Manipulations

A. The functions g and h are given by

$g(x) = e^{2x}$

$h(x) = \log_2(5x)$

i. Solve $g(x) = \frac{1}{e^6}$ for values of x in the domain of g.

ii. Solve $h(x) = 3$ for values of x in the domain of h.

B. The functions j and k are given by

$j(x) = 7^{(3x+1)} \cdot 7^x$

$k(x) = \sin(2x)\sec x$

i. Rewrite $j(x)$ as an expression of the form $7^{(\text{expression})}$.

ii. Rewrite $k(x)$ as an expression in which $\sin x$ appears exactly once and no other trigonometric functions are involved.

C. The function m is given by $m(x) = \tan^2(3x)$.

Find all input values for m in the interval $\left[0, \frac{\pi}{2}\right]$ that yield an output value of 1.

Free Response #4

	2024 Performance (1.28)	2025 Performance (1.9)	2026 Performance (1.94)
Point A1	0.37	0.5	0.31
Point A2	0.33	0.4	0.56
Point B1	0.16	0.4	0.51
Point B2	0.24	0.3	0.32
Point C1	0.15	0.1	0.19
Point C2	0.04	0.1	0.05

Free Response #4 – Strengths and Errors

- Strengths
  - Inclusion of sufficient work in part A
  - Correct use of exponent rules in part B
- Errors
  - Misuse of function notation for x = -3 (use of g(x) = -3)
  - Difficulty translating logarithmic equations into exponential form
  - Lack of fluency with trig identities and manipulation of trig expressions
  - Difficulty with tangent values and handling the square in part C

Free Response #4 – Student Needs

- Practice with log properties, trig function values, and trig identities
- Practice with solving equations without the help of technology (exponential, logarithmic, trigonometric)
- Practice showing all steps that lead to an answer
- Fluency with the fundamental trig identities
- Symbolic manipulation is very important to the course
- Familiarity with FRQ 4 directions
- Engage in graduated practice throughout the course

Pair Share

Find an elbow partner and share one item from this discussion that surprised you and one item that resonated with you.

Thank You!

Session Feedback QR Code:



Contact: julieharrison10@yahoo.com