

AP Precalculus Practice Worksheet

Fifty questions across polynomial and rational functions, exponential and logarithmic functions, and trigonometric and polar functions. Questions 45 to 50 ask for written working.

QUESTIONS	50	MULTIPLE CHOICE	14	WRITTEN	36
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Instructions

Show the reasoning behind each answer, not just the final value — that is what AP scoring rewards.

- 1** For $f(x) = x^2 + 1$ on $[0, 3]$, find the average rate of change.

- 2** For $f(x) = 2x^2$ on $[1, 2]$, find the average rate of change.

- 3** A polynomial has degree 4 and a positive leading coefficient. What is its end behavior?

- A) Rises both ends
- B) Falls both ends
- C) Rises left, falls right
- D) Falls left, rises right

- 4** A polynomial has degree 3 and a negative leading coefficient. What is its end behavior?

- A) Rises both ends
- B) Falls both ends
- C) Rises left, falls right
- D) Falls left, rises right

- 5** Find the vertical asymptote of $f(x) = (x-1)/(x+4)$.

- 6** Find the value of x that gives a hole (not an asymptote) in $f(x) = (x-2)(x+1)/(x-2)$.

- 7** As $x \rightarrow \infty$, what does $f(x) = (2x+1)/(x^2-4)$ approach?

- A) 0
- B) 2
- C) infinity
- D) -4

- 8** A function f is increasing on $(-2, 3)$ and decreasing on $(3, 7)$. What kind of point is $x = 3$?

- 9** A table shows outputs 2, 4, 8, 16 for equally spaced inputs. What type of function fits?

- A) Linear
- B) Exponential
- C) Quadratic
- D) Logarithmic

- 10** A table shows outputs 2, 5, 8, 11 for equally spaced inputs. What type of function fits?

- A) Linear
- B) Exponential
- C) Quadratic
- D) Logarithmic

- 11** Write an exponential model for a \$1,000 investment growing 4% per year.

- 12** Write an exponential model for a substance decaying 15% per hour starting at 80 grams.

- 13** Evaluate $\log_4(64)$.

- 14** Evaluate $\log_2(1/8)$.

- 15** Solve for x: $\log_5(x) = 2$.

- 16** Which is a property of ALL exponential functions $y = a \times b^x$ with $b > 1$?

- A) Constant first differences
- B) Constant ratios over equal intervals
- C) A vertical asymptote
- D) A maximum value

- 17** Find the amplitude of $y = 4\sin(x) - 2$.

- 18** Find the period of $y = \sin(3x)$.

- 19** Find the midline of $y = 2\sin(x) + 5$.

- 20** A Ferris wheel model is $h(t) = 15\sin(t) + 20$. Find its maximum height.

- 21** Find the period of $y = \cos(x/2)$.

- 22** What is the amplitude of $y = -3\cos(2x) + 1$?

- A) 1
- B) 2
- C) 3
- D) 6

- 23** Convert the polar point (4, 90 degrees) to rectangular coordinates.

- 24** Convert the polar point (2, 0 degrees) to rectangular coordinates.

- 25** In polar coordinates, r represents:
- A) The angle from the positive x -axis
 - B) The distance from the origin
 - C) The x -coordinate
 - D) The y -coordinate
- 26** A function models temperature as $T(t) = 10\sin(t) + 60$. Find $T(0)$.
- _____
- _____
- 27** If a function's rate of change is increasing, the graph is:
- A) Concave up
 - B) Concave down
 - C) Linear
 - D) Constant
- 28** If a function's rate of change is decreasing, the graph is:
- A) Concave up
 - B) Concave down
 - C) Linear
 - D) Constant
- 29** Find the average rate of change of $f(x) = x^3$ on $[0, 2]$.
- _____
- _____
- 30** Find the average rate of change of $f(x) = 2^x$ on $[0, 3]$.
- _____
- _____
- 31** Which best describes the end behavior of a rational function where the denominator's degree exceeds the numerator's?
- A) Approaches a nonzero constant
 - B) Approaches 0
 - C) Approaches infinity
 - D) Has no limit
- 32** Solve $\log_2(x) + \log_2(4) = 5$. (find x)
- _____
- _____
- 33** Simplify: $\log(100) + \log(10)$.
- _____
- _____
- 34** A quantity doubles every 3 years. Which model represents it, starting at a ?
- A) $y = a(2)^{x/3}$
 - B) $y = a(3)^{x/2}$
 - C) $y = a + 2x/3$
 - D) $y = 2ax/3$
- 35** Find $f(2)$ if $f(x) = 3(2)^x$.
- _____
- _____
- 36** Which function family has a constant SECOND difference for equally spaced inputs?
- A) Linear
 - B) Exponential
 - C) Quadratic
 - D) Logarithmic
- 37** For the polar point $(3, 180 \text{ degrees})$, find its rectangular coordinates.
- _____
- _____
- 38** The graph of $y = \sin(x)$ has what period?
- A) π
 - B) $2 \times \pi$
 - C) $\pi/2$
 - D) $4 \times \pi$

- 39** A rational function has a horizontal asymptote $y = 2$. What does this tell you about the numerator and denominator degrees and leading coefficients?

- 40** Explain why $f(x) = (x^2-1)/(x-1)$ has a hole at $x=1$ rather than an asymptote.

- 41** A population is modeled by $P(t) = 500(1.08)^t$. Explain what the 1.08 represents in context.

- 42** Explain, using average rate of change, why a function that is concave up has an increasing average rate of change over successive equal intervals.

- 43** A bacteria colony's data shows outputs that have a constant ratio of 1.5 for equally spaced time intervals. Write a model and explain why exponential (not linear) fits.

- 44** Find the exact value of $\sin(\pi/6)$.

- 45** Find the exact value of $\cos(\pi/3)$.

- 46** A sinusoidal model is $y = 5\sin(x - \pi/2) + 3$. Find its midline and amplitude.

- 47** Explain the difference between a local maximum and a global maximum using a specific graph description.

- 48** A rational function has vertical asymptotes at $x=2$ and $x=-3$. Write a possible denominator.

- 49** Explain why exponential functions never cross the x -axis (assuming $a > 0$).

- 50** A student claims a table with outputs 1, 4, 9, 16 for inputs 1, 2, 3, 4 is exponential. Explain why this is incorrect and identify the actual pattern.

Answer key

Direct answers only, in question order. Work the set first, then check.

1. 3	2. 6	3. A) Rises both ends	4. C) Rises left, falls right	5. $x = -4$
6. $x = 2$	7. A) 0	8. a local maximum	9. B) Exponential	10. A) Linear
11. $y = 1000(1.04)^x$	12. $y = 80(0.85)^x$	13. 3	14. -3	15. 25
16. B) Constant ratios over equal intervals	17. 4	18. $2 \times \pi/3$	19. $y = 5$	20. 35
21. $4 \times \pi$	22. C) 3	23. (0, 4)	24. (2, 0)	25. B) The distance from the origin
26. 60	27. A) Concave up	28. B) Concave down	29. 4	30. $7/3$
31. B) Approaches 0	32. 8	33. 3	34. A) $y = a(2)^{x/3}$	35. 12
36. C) Quadratic	37. (-3, 0)	38. B) $2 \times \pi$	39. The degrees are equal and the ratio of leading coefficients is 2	40. (x-1) is a factor of both the numerator and denominator, so it cancels, leaving a removable discontinuity instead of an asymptote
41. The population grows by 8% each time period, since the growth factor is $1 + 0.08$	42. As the function bends upward, each successive interval's secant line has a steeper slope, so the average rate of change increases	43. $y = a(1.5)^t$; exponential fits because equal time steps produce a constant multiplicative factor, not a constant additive difference	44. $1/2$	45. $1/2$

46. **midline $y=3$, amplitude 5**
47. **A local maximum is the highest point in its immediate neighborhood; a global maximum is the highest point over the entire domain, and a function can have several local maxima but only one global maximum**
48. **$(x-2)(x+3)$**
49. **b^x is always positive for any real x when $b>0$, so $a \times b^x$ can only equal zero if $a=0$, which is excluded**
50. **The ratios are not constant (4, 2.25, 1.78...) so it is not exponential; the outputs are perfect squares, matching a quadratic function $y = x^2$**
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Error log

Bring this page to your next session so the tutor can start from what actually blocked you.

Questions I answered incorrectly:

Was it the concept, the setup, or the arithmetic?

The single topic I want to start the next session with:
