

**HIGH SCHOOL PRE-CALCULUS QUIZ CONTEST 2024
SAMPLE QUESTIONS**

- (1) (a) The quadrant in which the point with polar coordinates $\left(-2, -\frac{3\pi}{4}\right)$ lies is _____. (**Answer: First**)
- (b) The polar coordinates (r, θ) of the point with polar coordinates $\left(-1, \frac{\pi}{3}\right)$ where $r > 0$ and $0 \leq \theta \leq 2\pi$ are _____. (**Answer: $\left(1, \frac{4\pi}{3}\right)$**)
- (2) (a) The center of the circle $(x + 1)^2 + (y - 2)^2 = 5$ lies in the _____ quadrant. (**Answer: Second**)
- (b) The radius of the circle centered at $(1, -3)$ and touching the x -axis is _____. (**Answer: 3**)
- (3) If $P(t)$ denotes the point on the unit circle with coordinates $\left(\frac{5}{13}, -\frac{12}{13}\right)$ then what are the coordinates of the point on the unit circle that corresponds to $P(\pi - t)$? (**Answer: $\left(-\frac{5}{13}, -\frac{12}{13}\right)$**)
- (4) (a) What is the domain of the function

$$f(x) = \frac{3}{\sqrt{5 - |x - 2|}}?$$

(**Answer: $(-3, 7)$**)

- (b) What is the range of the quadratic function

$$f(x) = -(x + 3)^2 - 2?$$

(**Answer: $(-\infty, -2]$**)

- (5) (a) The number of points in which the graph of $y = 3 - |x - 1|$ meets the x -axis is _____. (**Answer: 2**)
- (b) The number of points in which the graph of the function $f(x) = \begin{cases} x^2 + x - 2, & x \leq -2 \\ x - x^2, & x > -2 \end{cases}$ meets the x -axis is _____. (**Answer: 3**)
- (c) The number of points in which the graph of the function $f(x) = -3^x + 1$ meets the x -axis is _____. (**Answer: 1**)

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- (d) The number of points in which the graph of the function $f(x) = \sin 2x$, $0 \leq x \leq 2\pi$ meets the x -axis is _____.
(Answer: 5)
- (6) (a) Every polynomial function of degree n has n real zeros, some of which may be repeated (True or False). **(Answer: False)**
- (b) The equation $\sin^2 x - \sin x - 6 = 0$ has no solutions (True or False). **(Answer: True)**
- (7) (a) If $f(x) = \sqrt{x}$ and $(f \circ g)(x) = \sqrt{x^2 + 1}$ then $(g \circ f)(x) =$ _____. **(Answer: $x + 1$)**
- (b) If $g(x) = \sin x$ and $(f \circ g)(x) = e^{\sin x}$ then $(g \circ f)(x) =$ _____. **(Answer: $\sin e^x$)**
- (8) What is the radius of the circle given by the equation

$$x^2 + y^2 - 6x = 0?$$

(Answer: 3)

- (9) If $2^x = 1$ then what is the value of 2^{3x-1} ? **(Answer: $\frac{1}{2}$)**
- (10) If f is an odd function such that $f(-2) = 1$ and g is an even function such that $g(1) = 2$ then $g(f(2)) =$ _____.
(Answer: 2)
- (11) What is the value of $\sin(\arccos(-\frac{5}{13}))$? **(Answer: $\frac{12}{13}$)**
- (12) (a) The function $f(x) = |x - 3|$ is an even function (True or False). **(Answer: False)**
- (b) The function $f(x) = x \cos x + \sin x$ is an odd function (True or False). **(Answer: True)**
- (13) (a) A polynomial with real coefficients has zeros i and $1 - i$, and 1. What is the smallest possible degree of the polynomial?
(Answer: 5)
- (b) A polynomial has zeros i and $1 - i$, and 1. What is the smallest possible degree of the polynomial? **(Answer: 3)**
- (14) (a) If $\frac{\log a}{\log b} = 4$ then what is the value of $\log_{b^2} a^3$? **(Answer: 6)**
- (b) For any positive real number x , $\log_{x^2} \sqrt{x} =$ _____.
(Answer: $\frac{1}{4}$)
- (15) If $x - 1$ is a factor of the polynomial $x^3 + k^2x^2 - kx - 3$ find the values of k ? **(Answer: -1 and 2)**
- (16) If $2^{10} + 4^5 = 2^x$ then what is the value of x ? **(Answer: 11)**

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- (17) What is the period of the function $f(x) = \tan 5x$. (**Answer:** $\frac{\pi}{5}$)
- (18) (a) $\tan 48^\circ \tan 138^\circ =$ _____. (**Answer:** -1)
 (b) For any x such that $-1 \leq x \leq 1$, the value of $\cos(\sin^{-1} x + \cos^{-1} x)$ is _____. (**Answer:** 0)
- (19) If $P(x) = (x^2 + x - 2)(x^2 - 4)(x + 2)$ what is the multiplicity of the zero -2 ? (**Answer:** 3)
- (20) What is the maximum number of positive zeros of the polynomial $x^7 - 13x^6 - 6x^5 - 7x^4 + 11x^3 + 3x^2 - 6x - 5$. (**Answer:** 3)
- (21) If $x \neq 1$ and $x^3 = 1$ then what is the value of $x + x^2$? (**Answer:** -1)
- (22) What is the value of $\sin^2 \frac{3\pi}{8} + \sin^2 \frac{\pi}{8}$? (**Answer:** 1)
- (23) The value of $e^{\ln 3 + 3 \ln 2}$ is _____. (**Answer:** 24)
- (24) (a) If one of $\sin t$ and $\cos t$ is positive and the other negative then the possible values of t satisfy
 (i) $0 < t < \frac{\pi}{2}$.
 (ii) $0 < t < \pi$.
 (iii) $\frac{\pi}{2} < t < \pi$.
 (iv) $\pi < t < \frac{3\pi}{2}$.
 (v) $\frac{\pi}{2} < t < \frac{3\pi}{2}$.
 (vi) $\frac{3\pi}{2} < t < 2\pi$.
(Answer: (iii) and (vi))
 (b) If $0 \leq t \leq 2\pi$ and $\tan t$ is negative then what is the sign of $\sin 2t$? (**Answer:** **Negative**)
- (25) A quadratic equation has integer coefficients and leading coefficient in the equation is 1. If one of the roots of the quadratic equation is $2 + \sqrt{3}$ then the constant term in the equation is _____. (**Answer:** 1)