

**HIGH SCHOOL PRECALCULUS QUIZ CONTEST 2017
SAMPLE QUESTIONS**

- (1) (a) The quadrant in which the point with polar coordinates $\left(-2, \frac{3\pi}{4}\right)$ lies is _____. (**Answer: Fourth**)
- (b) The polar coordinates (r, θ) of the point with polar coordinates $\left(-1, -\frac{\pi}{6}\right)$ where $r > 0$ and $0 \leq \theta \leq 2\pi$ are _____. (**Answer: $\left(1, \frac{5\pi}{6}\right)$**)

- (2) The center of the circle $(x + 1)^2 + (y - 2)^2 = 5$ lies in the _____ quadrant. (**Answer: Second**)

- (3) (a) What is the domain of the function

$$f(x) = \frac{3}{\sqrt{2 - |x - 1|}}?$$

(**Answer: $(-1, 3)$**)

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

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

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

- (4) (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**)

- (d) The function $f(x) = |x - 3|$ is an even function (True or False). (**Answer: False**)

- (5) Every polynomial function of degree n has n real zeros, some of which may be repeated (True or False). (**Answer: False**)

- (6) What is the radius of the circle given by the equation

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

(**Answer: 3**)

2 HIGH SCHOOL PRECALCULUS QUIZ CONTEST 2017 SAMPLE QUESTIONS

- (7) If $f(x) = \sqrt{x}$ and $(f \circ g)(x) = \sqrt{x^2 + 1}$ then $(g \circ f)(x) =$ _____ . (**Answer:** $x + 1$)
- (8) If $2^x = 1$ then what is the value of 2^{3x-1} ? (**Answer:** $\frac{1}{2}$)
- (9) 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)
- (10) What is the value of $\sin(\arccos(-\frac{5}{13}))$? (**Answer:** $\frac{12}{13}$)
- (11) The function $f(x) = x \cos x$ is an odd function (True or False). (**Answer:** **True**)
- (12) (a) A polynomial with real coefficients has zeros i and $1 - i$, and 1. What is the smallest value of the degree of the polynomial? (**Answer:** 5)
- (b) A polynomial has zeros i and $1 - i$, and 1. What is the smallest value of the degree of the polynomial? (**Answer:** 3)
- (13) If $\frac{\log a}{\log b} = 4$ then what is the value of $\log_{b^2} a^3$? (**Answer:** 6)
- (14) 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)
- (15) If $2^{10} + 4^5 = 2^x$ then what is the value of x ? (**Answer:** 11)
- (16) What is the period of the function $f(x) = \tan 5x$. (**Answer:** $\frac{\pi}{5}$)
- (17) (a) $\tan 48^\circ \tan 138^\circ =$ _____. (**Answer:** -1)
- (b) For any x such that $-1 \leq x \leq 1$, the value of $\sin(\tan^{-1} x + \cot^{-1} x)$ is _____. (**Answer:** 1)
- (18) If $P(x) = (x^2 + x - 2)(x^2 - 4)(x + 2)$ what is the multiplicity of the zero -2 ? (**Answer:** 3)
- (19) 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)
- (20) What is the value of $\sin^2 \frac{3\pi}{8} + \sin^2 \frac{\pi}{8}$? (**Answer:** 1)
- (21) (a) If $\sin t$ and $\cos t$ are both positive or both 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: (i) and (iv))

(b) If $0 \leq t \leq 2\pi$ and $\tan t$ is negative then what is the sign of $\sin 2t$? **(Answer: Negative)**

(22) If $x \neq 1$ and $x^3 = 1$ then what is the value of $x + x^2$? **(Answer: -1)**

(23) 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)**

(24) The value of $e^{2\ln 3 + \ln 2}$ is _____. **(Answer: 18)**

(25) 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: $\left(-\frac{5}{13}, \frac{12}{13}\right)$)**