HIGH SCHOOL PRE-CALCULUS QUIZ CONTEST 2019
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)

(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)

(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 $-1 \le x \le 1$, 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 $0 \le t \le 2\pi$ 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)