HIGH SCHOOL PRECALCULUS QUIZ CONTEST 2016
SAMPLE QUESTIONS

(1) (a) The quadrant in which the point with polar coordinates $\left(-2, -\frac{2\pi}{3}\right)$ lies is _____. (**Answer: First**)

(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) What is the range of the quadratic function

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

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

(4) 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)

(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^{2x+1}? (**Answer:** 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 $\sin(\arccos(-\frac{3}{5}))$? (**Answer:** $\frac{4}{5}$)

(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 $\dfrac{\log a}{\log b} = 3$ then what is the value of $\log_b a^2$? (**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:** $\dfrac{\pi}{5}$)

(17) (a) $\tan 38^\circ \tan 52^\circ =$ _____. (**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)

(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) $0 < t < \dfrac{\pi}{2}$.

(ii) $0 < t < \pi$.

(iii) $\dfrac{\pi}{2} < t < \pi$.

(iv) $\pi < t < \dfrac{3\pi}{2}$.

(v) $\dfrac{\pi}{2} < t < \dfrac{3\pi}{2}$.

(vi) $\dfrac{3\pi}{2} < t < 2\pi$.

(**Answer:** (i) and (iv))

(b) If $0 \le t \le 2\pi$ 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 $e^{\ln 3 + \ln 5}$ is _____. (**Answer:** 15)

(25) If $P(t)$ denotes the point on the unit circle with coordinates $\left(-\frac{3}{5}, \frac{4}{5}\right)$ then what are the coordinates of the point on the unit circle that corresponds to $P(\pi + t)$? (**Answer:** $\left(\frac{3}{5}, -\frac{4}{5}\right)$)