HL1 Quiz #3 Name: Jerry Jiang

Mark each of the following statements as true or false.

T F 1. ${}^7P_3 = 210$. $\frac{7\times6\times5}{3\times2\times1}$ ✓

F 2. If $z = a + bi$ then $zz^* = a^2 - b^2$. $(a+bi)(a-bi) = a^2 - (bi)^2 = a^2 - b^2\cdot(-1)$ ✓

F 3. The equation $3x^2 - 7x + 5 = 0$ has two distinct real roots. $\Delta = 49 - 60$. ✓

F 4. The constant term in the expansion of $\left(x - \frac{1}{x}\right)^6$ is 20. ✓ $\binom{6}{3}\cdot 1^3(-1)^3 = -\frac{6\times5\times4}{3\times2\times1} = -20$

F 5. If $(a + bi)^2 = 5 - 12i$ then $ab = 6$. ✓ $a^2 - b^2 + 2abi = 5 - 12i$

$2ab = -12$

$ab = -6$

T 6. If the roots of the equation $x^2 - 10x + 5 = 0$ are α and β, then $\frac{1}{\alpha} + \frac{1}{\beta} = 2$. $\frac{\alpha+\beta}{\alpha\beta} = \frac{10}{5}$ $1 - \frac{10}{x} + \frac{5}{x^2} = 0$.

$\alpha+\beta = 10$ $\alpha\beta = 5$ $5a^2 - 10a + 1 = 0$

$-\left(\frac{-10}{5}\right) = 2$.

T 7. $\log_a b \times \log_b c = \log_a c$. $\frac{\log b}{\log a}\cdot\frac{\log c}{\log b}$ ✓

T 8. The expression $4a^2x^2 + 4abx + k$ becomes a perfect square if $k = b^2$. ✓

$4a^2x^2 + 4abx + b^2$

$= (2ax)^2 + 2\cdot(2ax)\cdot b + b^2$

T 9. The geometric series $1 + i + i^2 + i^3 + i^4 \cdots + i^{100}$ has sum 1. ✓

$-1 \quad -i \quad 1$

$\frac{1\cdot(1 - i^{101})}{1-i} = \frac{1-i}{1-i} = 1$

T 10. $(1 + i)^8 = 16$. ✓

$(1+i)^2 = 1 - 1 + 2i = 2i$

$(1+i)^4 = (2i)^2 = -4$.

$(1+i)^8 = (-4^2)^2 = 16$

$2i\cdot 2i\cdot 2i\cdot 2i$

$= 16$

Great! 9/10