2018 Year 12 Spec Exam Markers' Comments

Calc Free

1. Done well apart from some basic arithmetical errors

2. a) Did not find |w| instead found w^2 then tried to cube it.
   b) A number did not use conjugate and poor algebraic simplification done.
   c) Most had no idea. Had they thought geometrically they would have seen there were 5 roots.

3. a) Lost 1 mark for stating greater than *or equal to*
   b) Most did not write $g \circ f(x)$
   c) Needed to show that the range not equal to the domain rather than just make the statement.
4. a) Done well
   b) Large number did not complete the square to find inverse. Some who did only had the positive root rather than +/-

5.
   a) Very well done; most answers fully correct.
   b) Also very well done. A few students forgot to reflect the graph through the x-axis.

6. Generally very well done. The most common minor mistakes included forgetting to locate x-intercepts, and finding incorrect values for the y-intercept and asymptotes. A small number of students realised that the graph approaches the horizontal asymptote from below on the right – though most showed it approaching from above (no marks were deducted for this).
   A few sketched a vertically reflected graph (usually through the horizontal asymptote), and some drew the middle section as increasing, with a point of inflection instead of a local maximum.

7.
   a) Lots of correct answers, but also lots of minor calculation errors (usually involving negative numbers). Many students used incorrect vector notation (e.g. writing P instead of $\overrightarrow{CP}$ or $\overrightarrow{OP}$) which in some cases appeared to cause mistakes. For instance, several students calculated the vector $\overrightarrow{CP}$ (which they labelled P) and then used this as $\overrightarrow{OP}$ in a subsequent calculation, leading to an incorrect answer.
   b) This was done reasonably well, with most students calculating the vector product to obtain the Cartesian equation – but a few students obtained the correct answer starting with a vector equation of the form $r = a + \lambda b + \mu c$.
   No marks were deducted if the final Cartesian equation was unsimplified (e.g. as $48x + 24y + 32z = 192$ or with all terms negative).

Some students gave $r \cdot \begin{pmatrix} 6 \\ 3 \\ 4 \end{pmatrix} = 24$ as their final answer, and lost a mark since the question asked specifically for a Cartesian equation.

A significant number of students, when obtaining the normal vector, wrote $\begin{pmatrix} 48 \\ 24 \\ 32 \end{pmatrix} = \begin{pmatrix} 6 \\ 3 \\ 4 \end{pmatrix}$. I didn't deduct any marks for this, but it needs to be understood that a vector is not just a ratio of its components.

8.

a) Some students found this question challenging, with a significant number unable to put together the two pieces of information to find P (i.e. that it lies on the circle, and that its argument is $\tan^{-1} 3$). Many mistakenly took the modulus of P to be 5. Some students realised that the ratio $\frac{y}{x}$ must be 3, and then appeared to guess that $P = 3 + 9i$ (without any further justification) in which case they received 2 marks. No marks were deducted for failing to justify the rejection of $x = 0$ as a solution.

b) The circle was generally drawn correctly, even if part (a) was done poorly. If the value for P was incorrect in part (a), and then P was drawn somewhere on the circle in part (b), I gave FT marks only if the position of P plausibly matched the value found in (a) (which it usually didn't because P didn't actually lie on the circle).

9 Candidates used the dot product and collected like terms for an expression for magnitude squared. The next step was poorly carried through as this gave a perfect square when using inequalities.

10 Well answered with most successful candidates using the augmented matrix method.

11 Many methods were allowed and most candidates were able to show working. Many carless mistakes were made but if working was shown, follow through allowed for most marks.

12 Most candidates used cross product and stated correct steps. Errors occurred with entry into classpad.

13 To show this formula it was essential to note that each side was given by a vector subtraction of the given vectors. Only half of candidates used this approach.

14 There were 5 unknowns therefor 5 independent equations were needed to solve on classpad. To avoid complexity, expand the two complex factors to give a simpler expression. This method was demonstrated in last year's WACE paper.

15 Well answered by candidates but poor use of classpad resulting in careless mistakes. In the marking key are screen captures on correct use of classpad!

16 Most candidates realised that when multiplying complex numbers the arguments are added. Most errors were simple arithmetical errors. Most candidates realised that complex

numbers add as vectors, arrows were needed to obtain full marks. The last section was done by simply using solve capabilities on classpad.

17 Parts a and b were well answered. The last part involved expansion on the classpad, those who tried to do so manually wasted much time.

18 Vector integration was required as was done successfully. Most errors were in finding the vector constants with many simple arithmetical errors made. The last part required the use of the double angle formula allowing expressions for sin and cos. The identity of a unit circle only works if the angles are the same, this was missed by many candidates.

19 This was a very difficult question as planned. The use of the quadratic formula was essential. Many candidates did not realise that a function and its inverse only meet on the line y=x. The last part required an indepth knowledge on composite functions and was found quite challenging by candidates.

20 This question required 3 D visualising. The first part was well answered but the second part was given by dot product with itself. Many of these terms became zero as vectors d and e are perpendicular to b. Follow through for part c allowed many candidates to obtain full marks here.

21 The first part was well answered by candidates. For part b a tangent approach was needed. Those who sketched a simple diagram with the two triangles were successful.