A2 Mathematics
Beginning of the Year Review

Name:_____

1 Expand $(1 + 3x)^{\frac{2}{3}}$ in ascending powers of x, up to and including the term in x^3, simplifying the coefficients. [4]

2

(a) Sketch, on the same diagram, the graphs of $y = |2x - 9|$ and $y = 5x - 3$. [2]

(b) Solve the equation $|2x - 9| = 5x - 3$. [2]

3

(a) Express $3\sin 2\theta \sec\theta + 10\cos(\theta - 30°)$ in the form $R\sin(\theta + \alpha)$ where $R > 0$ and $0° < \alpha < 90°$. Give the value of α correct to 2 decimal places. [6]

(b) Hence solve the equation $3\sin 4\beta \sec 2\beta + 10\cos(2\beta - 30°) = 2$ for $0° < \beta < 90°$. [3]

4 Find, in terms of a, the set of values of x satisfying the inequality

$$2|3x + a| < |2x + 3a|,$$

where a is a positive constant. [4]

5

Solve the equation $\cos(\theta - 60°) = 3\sin\theta$, for $0° \leqslant \theta \leqslant 360°$. [5]

6

(a) By first expanding $\tan(2\theta + 2\theta)$, show that the equation $\tan 4\theta = \frac{1}{2}\tan\theta$ may be expressed as $\tan^4\theta + 2\tan^2\theta - 7 = 0$. [4]

(b) Hence solve the equation $\tan 4\theta = \frac{1}{2}\tan\theta$, for $0° < \theta < 180°$. [3]

7 Let $f(x) = \dfrac{5x^2 + 8x - 3}{(x-2)(2x^2+3)}$.

(a) Express $f(x)$ in partial fractions. [5]

(b) Hence obtain the expansion of $f(x)$ in ascending powers of x, up to and including the term in x^2. [5]

8 The polynomial $p(x)$ is defined by

$$p(x) = ax^3 - 11x^2 - 19x - a,$$

where a is a constant. It is given that $(x-3)$ is a factor of $p(x)$.

(a) Find the value of a. [2]

(b) When a has this value, factorise $p(x)$ completely. [3]

(c) Hence find the exact values of y that satisfy the equation $p(e^y + e^{-y}) = 0$. [4]

9

(a) Solve the equation $\ln(2+x) - \ln x = 2\ln 3$. [3]

(b) Hence solve the equation $\ln(2+\cot y) - \ln(\cot y) = 2\ln 3$ for $0 < y < \frac{1}{2}\pi$. Give your answer correct to 4 significant figures. [2]

10

(a) Find the quotient when $x^4 - 32x + 55$ is divided by $(x-2)^2$ and show that the remainder is 7. [3]

(b) Factorise $x^4 - 32x + 48$. [2]

(c) Hence solve the equation $e^{-12y} - 32e^{-3y} + 48 = 0$, giving your answer in an exact form. [2]

Solutions

1. May 2021 P33
2. May 2022 P23
3. May 2022 P23
4. May 2022 P33
5. May 2022 P33
6. May 2021 P33
7. May 2022 P33
8. May 2021 P21
9. May 2021 P22
10. May 2021 P22