1. Nov/2020/Paper_13/No.6

It is known that $y = A \times 10^{bx^2}$, where A and b are constants. When $\lg y$ is plotted against x^2, a straight line passing through the points (3.63, 5.25) and (4.83, 6.88) is obtained.

(a) Find the value of A and of b. [4]

Using your values of A and b, find

(b) the value of y when $x = 2$, [2]

(c) the positive value of x when $y = 4$. [2]

2. Nov/2020/Paper_22/No.4

Solve the simultaneous equations.

$$\log_3(x+y) = 2$$
$$2\log_3(x+1) = \log_3(y+2)$$

[6]

3. Nov/2020/Paper_22/No.10

The number, b, of bacteria in a sample is given by $b = P + Qe^{2t}$, where P and Q are constants and t is time in weeks. Initially there are 500 bacteria which increase to 600 after 1 week.

(a) Find the value of P and of Q. [4]

(b) Find the number of bacteria present after 2 weeks. [1]

(c) Find the first week in which the number of bacteria is greater than 1 000 000. [3]

4. Nov/2020/Paper_23/No.8

DO NOT USE A CALCULATOR IN THIS QUESTION.

$$\log_2(y+1) = 3 - 2\log_2 x$$
$$\log_2(x+2) = 2 + \log_2 y$$

(a) Show that $x^3 + 6x^2 - 32 = 0$. [4]

(b) Find the roots of $x^3 + 6x^2 - 32 = 0$. [4]

(c) Give a reason why only one root is a valid solution of the logarithmic equations. Find the value of y corresponding to this root. [2]

5. June/2020/Paper_11/No.3

The radius, r cm, of a circle is increasing at the rate of $5\,\text{cms}^{-1}$. Find, in terms of π, the rate at which the area of the circle is increasing when $r = 3$. [4]

6. June/2020/Paper_12/No.2

The volume, V, of a sphere of radius r is given by $V = \frac{4}{3}\pi r^3$.

The radius, r cm, of a sphere is increasing at the rate of $0.5\,\text{cms}^{-1}$. Find, in terms of π, the rate of change of the volume of the sphere when $r = 0.25$. [4]

7. June/2020/Paper_21/No.1

Variables x and y are such that, when $\sqrt[4]{y}$ is plotted against $\frac{1}{x}$, a straight line graph passing through the points (0.5, 9) and (3, 34) is obtained. Find y as a function of x. [4]

8. June/2020/Paper_22/No.1

Variables x and y are such that $y = \sin x + e^{-x}$. Use differentiation to find the approximate change in y as x increases from $\frac{\pi}{4}$ to $\frac{\pi}{4} + h$, where h is small. [4]

9. June/2020/Paper_22/No.9b

(b) $\log_a \sqrt{b} - \frac{1}{2} = \log_b a$, where $a > 0$ and $b > 0$.

Solve this equation for b, giving your answers in terms of a. [5]