

1. (i) Variables x and y are connected such that when $\lg y$ is plotted against x , a straight line is obtained. The straight line passes through the points $(2, 2)$ and $(5, 11)$. Express y in terms of x . $y=10^{(3x-4)}$ [2]
- (ii) Find the value of y when $x = 1$. $y=0.1$ [2]
2. The variables x and y are related by the equation $y = ax^3 + bx^2$, where a and b are constants. When the graph of $\frac{y}{x^2}$ against x is drawn, a straight line is obtained. The straight line passes through the points $(3, 0)$ and $(6, 2)$.
- (i) Find the value of a and of b . $a=2/3, b=-2$ [4]
- (ii) Find the value of y when $x = 6$. $y=72$ [2]
3. In a chemical reaction, a solid substance slowly dissolves in a liquid. At the start of the reaction, there are M grams of the substance. After t minutes, there are x grams of the substance still to be dissolved. It is known that x and t are related by the equation $x = 8e^{-\frac{t}{5}}$.
- (i) Find the value of M . $m=8$ [1]
- (ii) Estimate the time taken for half of the substance to be dissolved. 3.47 [2]
4. (a) Given that $(5^{1-x})(3^{x+3}) = 20$, find the value of $\left(\frac{3}{5}\right)^x$. 4/27 [2]
- (b) Hence, solve the equation $(5^{1-x})(3^{x+3}) = 20$. 3.74 [1]
5. Solve the equation $2 \log_3 x = 1 + 5 \log_x 9$. $x=3^{(2.5)}=15.6, 1/9$ [4]
6. Using long division, find the remainder when $-x^4 - x^3 + x^2 + 2x + 8$ is divided by $x^2 - 3$. $-x+2$ [2]
7. It is given that $f(x) = ax^3 - (a+3b)x^2 + 2bx + c$ is divisible by $x^2 - 2x$.
- (i) Show that $c = 0$ and $a = 2b$. [2]
- When $f(x)$ is divided by $x - 1$, the remainder is 8 more than when it is divided by $x + 1$.
- (ii) Find the values of a and b . Hence, or otherwise, factorise $f(x)$ completely. [4]
- (iii) Sketch the graph of $y = f(x)$, indicate clearly the x and y intercepts. [2]

End of Paper $a=2, b=1$
 $f(x)=x(2x-1)(x-2)$