Numerical Methods - MA 207
Curve Fitting

1. Convert the following equations into linear form

   (a) $y = \frac{x}{a+bx}$

   (b) $y = \frac{ax+b}{x}$

   (c) $xa^y = b$

   (d) $y = \frac{b}{x(x-a)}$

   (e) $xy = ax + b$

   (f) $y = ax + bx^2$

   (g) $y = ax + bxy$.

2. Find the most plausible values of x, y and z from the equations

$$
\begin{aligned}
x + 3y - 3z &= -14 \\
4x + y + 4z &= 21 \\
3x + 2y - 5z &= 5 \\
x - y + 2z &= 3
\end{aligned}
$$

   by forming the normal equations.

3. Construct a least squares quadratic approximation to the function $y(x) = \sin x$ on $[0, \pi/2]$ with respect to the weight function $W(x) = 1$.

4. If P is the pull required to lift a load W by means of a pulley block, find a linear law of the form $P = mW + C$, connecting P and W, using the following data.

P (in kg.)	12	15	21	25
W (in kg.)	50	70	100	120

   Compute P when $W = 150$ kg.

5. By the method of least squares, find the straight line that best fits the following data.

x	1	2	3	4	5
y	14	27	40	55	68

6. Fit a straight line to the following data and estimate the value of y corresponding to $x = 6$.

x	0	5	10	15	20	25
y	12	15	17	22	24	30

7. Fit a second degree parabola by taking x as the independent variable.

x	1	1	2	3	4
y	1	5	10	22	38

8. Using the method of least squares, fit a curve of the form $y = ab^x$ to the following data.

x	1	2	3	4
y	4	11	35	100

9. Fit a curve of the form $y = ab^x$ to the following data.

Year (x)	1951	1952	1953	1954	1955	1956	1957
Production in tone (y)	201	263	314	395	427	504	612

10. Fit a curve of the form $y = ax^b$ for the following data, where a and b are constants.

x	61	26	7	10
y	350	400	500	600

11. Using the principle of least squares, fit an equation of the form $y = ae^{bx}$ $(a > 0)$ to the data.

x	1	2	3	4
y	1.65	2.7	4.5	7.35

12. The pressure and volume of a gas are related by the equation $pc^\lambda = k$ (λ and k are constants). Fit this equation for the following data, using the principle of least squares.

p	0.5	1.0	1.5	2.0	2.5	3.0
v	1.62	1.00	0.75	0.62	0.52	0.46

13. Two quantities of x and y are measured and corresponding values are given in the following table.

x	20	40	60	80	100	120
y	5.5	9.1	14.9	22.8	33.3	46

Find a second degree parabola to the data.

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