EDUCATIVE JEE (MATHEMATICS)

Errata as updated on March 13, 2004

(A negatively numbered line is to be counted from the bottom.)

At several places, the horizontal line between the numerator and the denominator in a fraction is missing. This has happened on the following pages (the line numbers being indicated in the parentheses):

97 (−6), 167 (−3), 190 (3), 214 (10), 258 (−3), 309(23), 334 (7), 365 (−1), 435 (6), 441 (2), 953 (5).

Similarly, at some places the horizontal line in a long radical sign is missing, e.g. the first radical sign in line 6, p. 199.

On p. 119, line 6, the expression $u + v + w$ is spaced heavily because of an inadvertent linebreak.

On p. 141, in Paragraph 1, the divisibility of $5^k - 5$ by 4 can be proved more easily by writing it as $5(5^{k-1} - 1^{k-1})$ and factorising.

On p. 302, in Figure (a), the points P and C should be joined to each other by a straight line.

On p. 158, add the following exercise at the end.

(4.41) Suppose a function $f : \mathbb{N} \longrightarrow \mathbb{N}$ satisfies the condition that $f(mn) = f(m)f(n)$ for all $m, n \in \mathbb{N}$. (As remarked in Exercise (4.37) (iii), this condition is stronger than multiplicativity.) Prove that :

(a) $f(1) = 1$ and f is uniquely determined by its values on primes. [*Hint:* Use unique factorisation of integers into prime powers.]

(b) if further $f(2) = 2$ and f is strictly increasing then $f(n) = n$ for all n. [*Hint:* Let p_k be the k-th prime, with $p_1 = 2$, $p_2 = 3$ etc. Use (a) and induction on k to show that $f(p_k) = p_k$. Note that for $k > 1$, the prime factors of $p_k - 1$ and $p_k + 1$ are all less than p_k and hence $f(p_k - 1) = p_k - 1$ and $f(p_k + 1) = p_k + 1$. Fit in $f(p_k)$.]

On p. 189, the easiest solution to Exercise (5.11), requires some properties of ω, the complex cube root of unity.

On p. 230 add the following exercise as part (c) of Exercise (6.27)

(c) Find the digit in the 100-th place after the decimal in the decimal expansion of $(\sqrt{2}+1)^{300}$.

On p. 345, for the problem in Comment No. 12, a simpler, calculus-based solution can be given by considering $f'(x)$. The function f is undefined at 1, increases strictly on $(-\infty,-1)$ on $(0,1)$ and also on $(1+\sqrt{2},\infty)$ and decreases strictly on $(1,1+\sqrt{2})$. Since $f(1+\sqrt{2}) = 3+2\sqrt{2}$, we get the range of f on S as given.

On p. 365, a simpler and a more direct solution to the Main Problem can be given by writing $\dfrac{r_1r_2r_3}{r_1+r_2+r_3}$ as $\dfrac{r^2(\cot\frac{A}{2}\cot\frac{B}{2}\cot\frac{C}{2})}{\cot\frac{A}{2}+\cot\frac{B}{2}+\cot\frac{C}{2}}$ and then using (9) on p. 369.

In the figure on p. 369, the line ID should be perpendicular to the side BC.

On p. 392, add the following exercise at the end.

(11.38) Let P be a point on the arc BC of the circumcircle of an equilateral triangle ABC. Prove that $AP = BP + PC$.

In line -8 on p. 418, the solution given is for Part (a). The answer to Part (b) is $\frac{7}{6}x^2+\frac{3}{2}x-\frac{2}{3}$. (Let $p(x) = q(x)(x-1)(x+2)(x+1) + a_2x^2 + a_1x + a_0$. Then $p(1) = 2, p(-2) = 1$ and $p(-1) = -1$ gives a system of three linear equations in the unknowns a_0, a_1 and a_2.)

On p.423, at the end of line 8, add 'since the 13ths fall on the days $[0],[3],[4],[0],\ldots,[4],[6]$.'

On p. 435, a simple geometric solution to Exercise 19 can be given by taking the line segment from $(1,0)$ to $(0,1)$ and considering the points on it that are closest and farthest from the origin.

On p. 436, the last part of the solution to Exercise (6.27) (b) needs a correction. The last term of the summation is not 10, but 5^m2 which is congruent to 2 modulo 4.

On p. 448, the solution to Exercise 12(b) needs a little more elaboration and correction. Take the midpoint of the chord as $(\lambda,-\lambda)$ for some λ. The requirement that the point $(2\lambda-u,-2\lambda-v)$ lies on the given circle for two distinct values of λ comes out as $7(u+v)^2+4uv<0$. This reduces to $a^2>4$, i.e. $a\in(-\infty,-2)\cup(2,\infty)$.

On p. 789, the definition of collective independence of three events as given is not correct. The correct definition of collective independence of, say, n events $A_1, A_2, \ldots, A_n$, is that for every set of indices $j_1, j_2, \ldots, j_m$ with $1 \leq j_1 < j_2 < \ldots < j_m \leq n$, $P(A_{j_1} \cap A_{j_2} \cap \ldots \cap A_{j_m}) = P(A_{j_1})P(A_{j_2}) \ldots P(A_{j_m})$. This, in particular implies that they are pairwise independent. But the converse is false. The solution to the problem there remains unaffected. (Contributed by Prof. V. G. Tikekar.)

On p. 809, add the following exercise at the end.

(22.23) One hundred persons stand in a queue and buy tickets one-by-one. When a ticket is given, the birthday of the person is also noted. A free ticket is given to the first person, if any, whose birthday is already recorded. Ignoring leap year and assuming that all birthdays are equally likely, find which person in the queue has the maximum chance of getting a free ticket.

Some other corrections are tabulated below. A reader who notices any other mistake is urged to contact the author immediately, preferably on the e-mail (kdj@math.iitb.ac.in) or on the phone (022) 25767467, (022) 2576 8467. The errata will be displayed on the personal home page of the author (www.math.iitb.ac.in/faculty/kdjoshi) and will be updated from time to time. Alternate solutions are also welcome. Those that are particularly elegant or instructive will be displayed on this webpage along with the names of their first contributors (except when they request anonymity).

Page No.	Line	incorrect	correct
76	-5	$\begin{vmatrix} \cos A & \sin A & 0 \\ \cos A & \sin A & 0 \\ \cos A & \sin A & 0 \end{vmatrix}$	$\begin{vmatrix} \cos A & \sin A & 0 \\ \cos B & \sin B & 0 \\ \cos C & \sin C & 0 \end{vmatrix}$
78	-13	multilineari+++ty	multilinearity
86	2	THEOTY	THEORY
97	7	them all,	them, all
129	-15	$(11 - k)$	$(13 - k)$
152	-18	is even	is odd
198	13	**G.M.**$-H.M.$	**G.M.−H.M.**
217	-7	12 students	13 students

Page No.	Line	incorrect	correct
219	4	contain	contain m
236	12	where n is	where θ is
279	8	respectively.	respectively
298	-11	roots of (1)	roots of (2)
331	2	TRICONOMETRIC	TRIGONOMETRIC
343	-9	if call	if we call
370	11	the Main Problem	this problem
371	2	angles	angle
412	3	numbers of	numbers, say x, y, z, of
412	10	$\binom{2}{1}\binom{4}{3}\binom{2}{1}$	$\binom{2}{1}\binom{4}{3}\binom{2}{2}$
414	-3	$a = 7, b = 6$	$a = 5, b = 8$
414	-3	$3c^2$	$\frac{c^2}{6}$
418	-6	(c) $x = \frac{5}{4}$	(c) no solution
421	-5	**26.**	**27.**
423	6	[8]	[1]
424	-6	$\frac{1}{16}$	$\frac{1}{4}$
429	1	$\sum_{k=0}^{n}\binom{n}{k}x^k$	$\sum_{k=0}^{n}\binom{n}{n-k}x^k$
430	10	$= (\frac{1+i\sqrt{3}}{2})^{6m}$	$= (\frac{1-i\sqrt{3}}{2})^{6m}$
434	5	$\|a + b - 2c\| \geq \|a - b\|$	$\|a + b - 2c\| \leq \|a - b\|$
434	-5, -4	Chapter 3	Chapter 24
435	1	$\log_a x > 1$	$\log_a x < 1$
437	8,9	periodicity condition	periodicity-like condition
437	13	its period is 63	we have $g(x+1) = g(x) + 63$
440	1	$(\frac{1}{21})^n < \frac{3}{6}$	$(\frac{19}{21})^n < \frac{3}{5}$
441	1	1	4
441	1	$2\sin 20^\circ \cos 20^\circ$	$\frac{1}{2}\sin 20^\circ \cos 20^\circ$
446	3	$z_2 = \pm z_1$	$z_2 = \pm i z_1$
447	14	$z - 1$	z_1
449	2,3	or even to .... etc.	separately.
456	-7	. hence	. Hence
457	-18	$2\sqrt{2} - 4)$	$(2\sqrt{2} - 4)$
457	-16	eqatuing	equating
470	-11	constannt	constant

Page No.	Line	incorrect	correct
531	20	$\frac{1}{2}$	$\frac{1}{4}$
569	-8	if $1 \leq 1$	if $1 \leq x$
668	1	(12)	(10)
726	8	studies	studied
728	4	(18.7)	(18.6)
897	3	$x - \frac{x^2}{2} + \frac{x^4}{4}$	$x - \frac{x^2}{2} + \frac{x^3}{4}$
957	10	$\frac{x}{1+\frac{x^2}{2}}$	$\frac{x}{1+\frac{x}{2}}$
965	-13	evey	every

For more corrections/additions, see the ERRATA TO THE REVISED REPRINT.