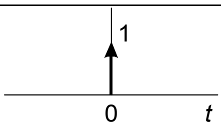
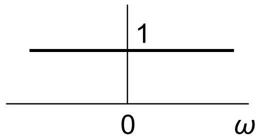
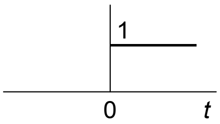
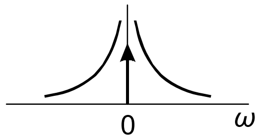
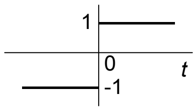
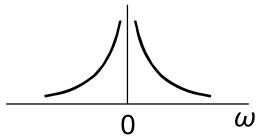
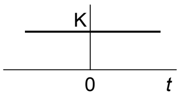
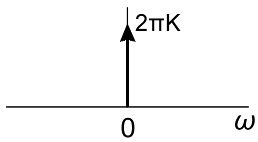
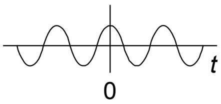
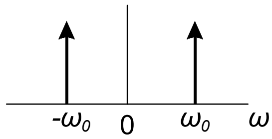
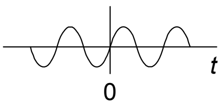
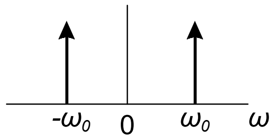
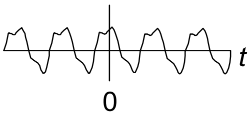
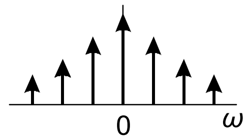
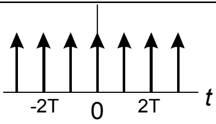
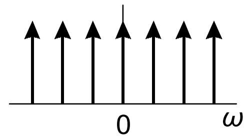
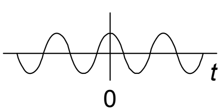
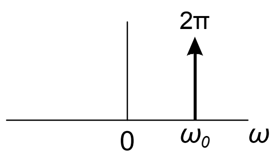
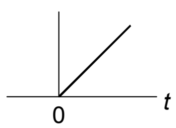
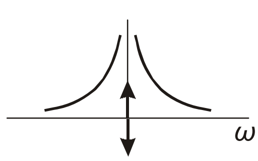
ΠΙΝΑΚΑΣ 1: ΣΕΙΡΕΣ FOURIER

ΜΟΡΦΗ	ΣΕΙΡΑ	ΣΥΝΤΕΛΕΣΤΕΣ	ΤΥΠΟΙ ΑΛΛΑΓΗΣ
Εκθετική	$f(t) = \sum_{n=-\infty}^{\infty} F_n e^{jn\omega_0 t}$	$F_n = \frac{1}{T}\int_0^T f(t) e^{-jn\omega_0 t} dt$	$F_0 = a_0$ $F_n = \frac{1}{2}(a_n - jb_n)$
Τριγωνομετρική Α	$f(t) = a_0 + \sum_{n=1}^{\infty} a_n \cos n\omega_0 t$ $+ \sum_{n=1}^{\infty} b_0 \sin n\omega_0 t$	$a_0 = \frac{1}{T}\int_0^T f(t) dt$ $a_n = \frac{2}{T}\int_0^T f(t)\cos(n\omega_0 t) dt$ $b_n = \frac{2}{T}\int_0^T f(t)\sin(n\omega_0 t) dt$	$a_n = (F_n + F_{-n})$ $b_n = j(F_n - F_{-n})$ $a_0 = F_0$
Τριγωνομετρική Β	$f(t) = a_0 + \sum_{n=1}^{\infty} A_n \cos(n\omega_0 t + \Phi_n)$		$A_n = \sqrt{a_n^2 + b_n^2} = 2\lvert F_n \rvert$ $\Phi_n = -\tan^{-1}\left(\frac{b_n}{a_n}\right)$

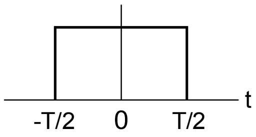
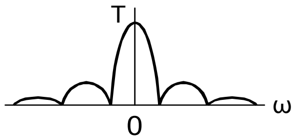
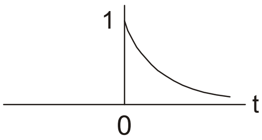
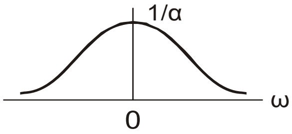
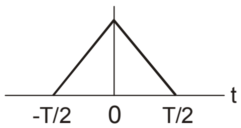
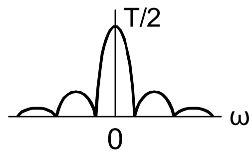
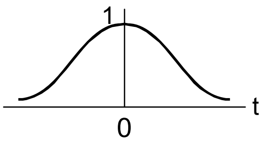
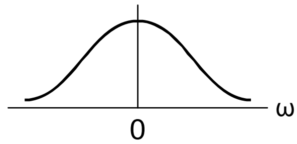
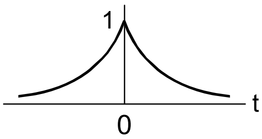
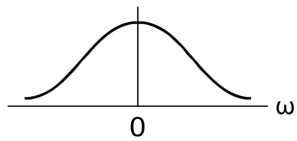
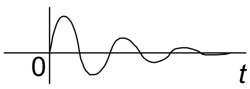
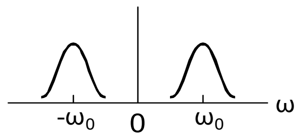
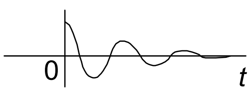
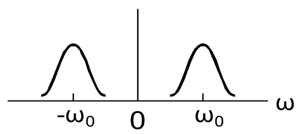
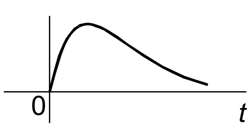
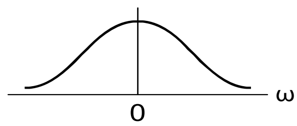
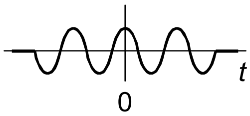
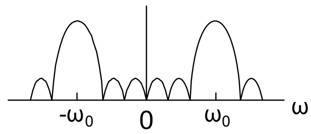
ΠΙΝΑΚΑΣ 1.2: ΜΕΤΑΣΧΗΜΑΤΙΣΜΟΙ FOURIER ΜΑΘΗΜΑΤΙΚΩΝ ΔΙΑΔΙΚΑΣΙΩΝ

ΔΙΑΔΙΚΑΣΙΑ	**f(t)**	**F(ω)**
Μετασχηματισμός	$f(t)$	$\int_{-\infty}^{\infty} f(t)e^{-j\omega t}dt$
Αντιστροφή	$\frac{1}{2\pi}\int_{-\infty}^{\infty} F(\omega)e^{j\omega t}d\omega$	$F(\omega)$
Υπέρθεση	$a_1 f_1(t) + a_2 f_2(t)$	$a_1 F_1(\omega) + a_2 F_2(\omega)$
Αναστροφή	$f(-t)$	$F(-\omega)$
Συμμετρία	$F(t)$	$2\pi f(-\omega)$
Κλιμάκωση	$f(at)$	$\frac{1}{\lvert a \rvert} F\left(\frac{\omega}{a}\right)$
Καθυστέρηση	$f(t-t_0)$	$e^{-j\omega t_0}F(\omega)$
Διαμόρφωση	$e^{j\omega_0 t}f(t)$	$F(\omega-\omega_0)$
Χρονική Διαφόριση	$\frac{d^n}{dt^n}f(t)$	$(j\omega)^n F(\omega)$
Διαφόριση στη Συχνότητα	$t^n f(t)$	$(j)^n \frac{d^n}{d\omega^n}F(\omega)$
Ολοκλήρωση	$\int_0^t f(t')dt' + \int_{-\infty}^{t} f(t')dt'$	$\frac{1}{j\omega}F(\omega)$
Ολοκληρωση	$\int_{-\infty}^{t} f(t')dt'$	$\frac{1}{j\omega}F(\omega) + \pi F(0)\delta(\omega)$
Δίπλωση	$f_1 * f_2 = \int_{-\infty}^{\infty} f_1(\lambda) f_2(t-\lambda)d\lambda$	$F_1(\omega)F_2(\omega)$
Γινόμενο	$f_1(t)f_2(t)$	$\frac{1}{2\pi}\int_{-\infty}^{\infty} F_1(\xi)F_2(\omega-\xi)d\xi$

ΠΙΝΑΚΑΣ 1.3: ΜΕΤΑΣΧΗΜΑΤΙΣΜΟΙ FOURIER ΣΗΜΑΤΩΝ ΙΣΧΥΟΣ

***f*(*t*)**		***F*(ω)**	**$\lvert F(\omega)\rvert$**
 μοναδιαία κρουστική συνάρτηση	$\delta(t)$	1	
 μοναδιαίο βήμα	$u(t)$	$\pi\delta(\omega)+\dfrac{1}{j\omega}$	
	$\operatorname{sgn}(t)=\dfrac{t}{\lvert t\rvert}$	$\dfrac{2}{j\omega}$	
 σταθερά	K	$2\pi K\delta(\omega)$	
 συνημίτονο	$\cos\omega_0 t$	$\pi[\delta(\omega-\omega_0)+\delta(\omega+\omega_0)]$	
 ημίτονο	$\sin\omega_0 t$	$-j\pi[\delta(\omega-\omega_0)-\delta(\omega+\omega_0)]$	
 περιοδικό σήμα	$\sum_{n=-\infty}^{\infty} f_T(t-nT)$	$\dfrac{2\pi}{T}\sum_{n=-\infty}^{\infty} F_T\left(\dfrac{2\pi n}{T}\right)\delta\left(\omega-\dfrac{2\pi n}{T}\right)$	
 τρένο ώσεων	$\sum\delta(t-nT)$	$\dfrac{2\pi}{T}\sum\delta\left(\omega-\dfrac{2\pi n}{T}\right)$	
 μιγαδικό ημίτονο	$e^{j\omega_0 t}$	$2\pi\delta(\omega-\omega_0)$	
 μοναδιαίας κλίσης	$tu(t)$	$j\pi\delta'(\omega)-\dfrac{1}{\omega^2}$	

ΠΙΝΑΚΑΣ 1.4: ΜΕΤΑΣΧΗΜΑΤΙΣΜΟΙ FOURIER ΣΗΜΑΤΩΝ ΕΝΕΡΓΕΙΑΣ

<table>
<tr><th colspan="2">f(t)</th><th>F(ω)</th><th>|F(ω)|</th></tr>
<tr><td>τετραγωνικός παλμός</td><td>$u\left(t+\frac{T}{2}\right)-u\left(t-\frac{T}{2}\right)$</td><td>$T\frac{\sin(\omega T/2)}{\omega T/2}$</td><td></td></tr>
<tr><td>εκθετικό</td><td>$e^{-at}u(t)$</td><td>$\frac{1}{j\omega+a}$</td><td></td></tr>
<tr><td>τριγωνικό</td><td>$t-2\frac{|t|}{T}, \quad |t|<\frac{T}{2}$
$0, \quad \alpha\lambda\lambda o\acute{\upsilon}$</td><td>$\frac{T}{2}\left[\frac{\sin(\omega T/4)}{\omega T/4}\right]^2$</td><td></td></tr>
<tr><td>Gaussian</td><td>$e^{-a^2t^2}$</td><td>$\frac{\sqrt{\pi}}{a}e^{-(\omega^2/4a^2)}$</td><td></td></tr>
<tr><td>διπλό εκθετικό</td><td>$e^{-a|t|}$</td><td>$\frac{2a}{a^2+\omega^2}$</td><td></td></tr>
<tr><td>αποσβενώμενο
ημίτονο</td><td>$e^{-at}\sin(\omega_0 t)u(t)$</td><td>$\frac{\omega_0}{(a+j\omega)^2+\omega_0^2}$</td><td></td></tr>
<tr><td>αποσβενώμενο
συνημίτονο</td><td>$e^{-at}\cos(\omega_0 t)u(t)$</td><td>$\frac{a+j\omega}{(a+j\omega)^2+\omega_0^2}$</td><td></td></tr>
<tr><td></td><td>$\frac{1}{\beta-\alpha}\left[e^{-\alpha t}-a^{-\beta t}\right]u(t)$</td><td>$\frac{1}{(j\omega+\alpha)(j\omega+\beta)}$</td><td></td></tr>
<tr><td>συνημιτονικός παλμός</td><td>$\cos(\omega_0 t)\left[u\left(t+\frac{T}{2}\right)-u\left(t-\frac{T}{2}\right)\right]$</td><td>$\frac{T}{2}\left[\frac{\sin(\omega-\omega_0)T/2}{(\omega-\omega_0)T/2}+\frac{\sin(\omega+\omega_0)T/2}{(\omega+\omega_0)T/2}\right]$</td><td></td></tr>
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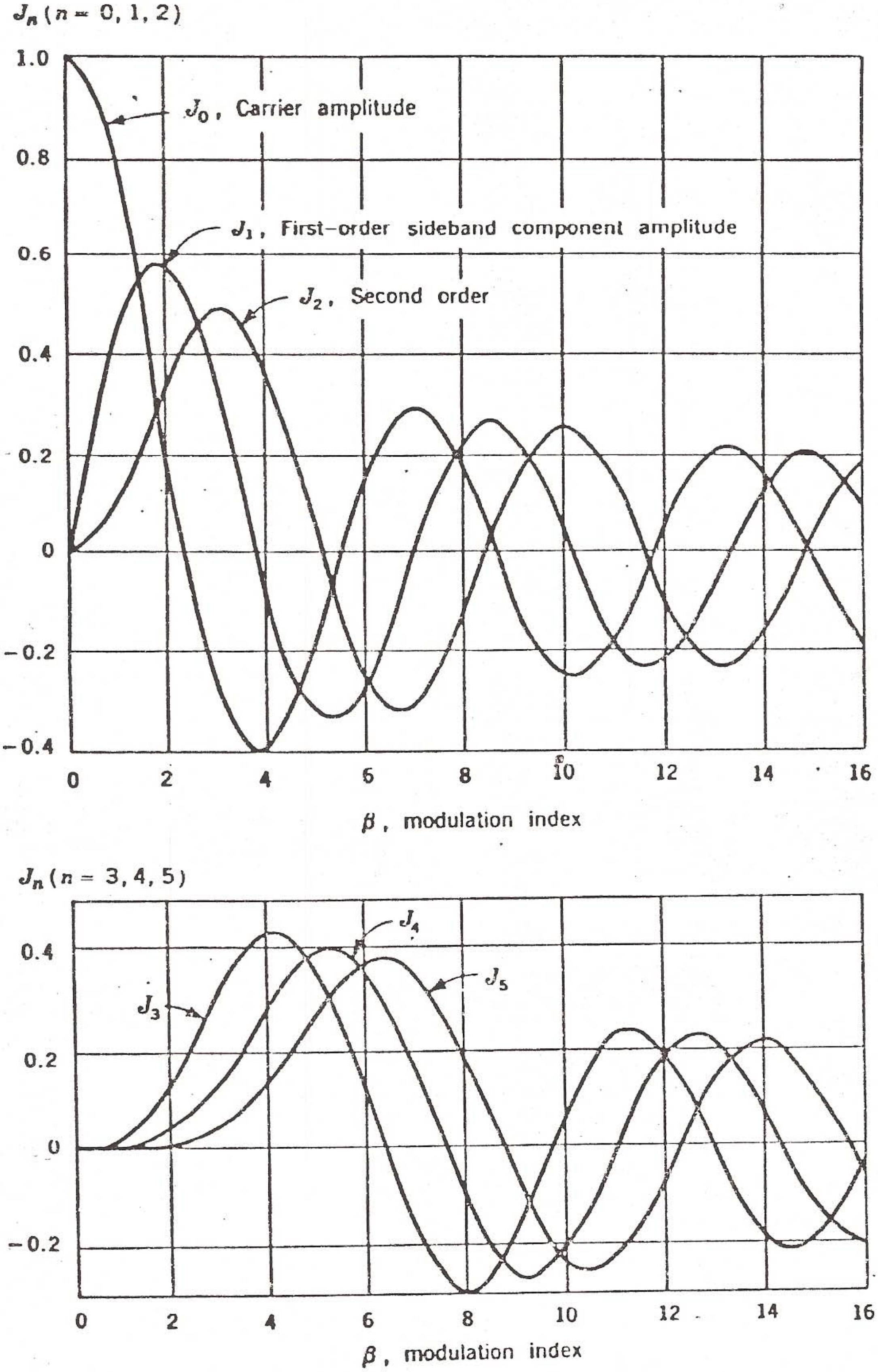

Fig. 4.6-1 The Bessel functions $J_n(\beta)$ plotted as a function of β for $n = 0, 1, 2, \ldots, 5$.

4.7-1 Values of the Bessel functions $J_n(\beta)$ for various orders n and integral values of β

1	2	3	4	5	6	7	8	9	10
.7652	.2239	−.2601	−.3971	−.1776	.1506	.3001	.1717	−.09033	−.2459
.4401	.5767	.3391	−.06604	−.3276	−.2767	−.004683	.2346	.2453	.04347
.1149	.3528	.4861	.3641	.04657	−.2429	−.3014	−.1130	.1448	.2546
.01956	.1289	.3091	.4302	.3648	.1148	−.1676	−.2911	−.1809	.05838
.002477	.03400	.1320	.2811	.3912	.3576	.1578	−.1054	−.2655	−.2196
	.007040	.04303	.1321	.2611	.3621	.3479	.1858	−.05504	−.2341
	.001202	.01139	.04909	.1310	.2458	.3392	.3376	.2043	−.01446
		.002547	.01518	.05338	.1296	.2336	.3206	.3275	.2167
			.004029	.01841	.05653	.1280	.2235	.3051	.3179
				.005520	.02117	.05892	.1263	.2149	.2919
				.001468	.006964	.02354	.06077	.1247	.2075
					.002048	.008335	.02560	.06222	.1231
						.002656	.009624	.02739	.06337
							.003275	.01083	.02897
							.001019	.003895	.01196
								.001286	.004508
									.001567