Homework #01

Problem 1

$f_1 = 0.4$	$x_1(t) = \cos(2\pi f_1 t)$	$x_1[n] = \cos(2\pi f_1 n)$
$f_2 = 0.6$	$x_2(t) = \cos(2\pi f_2 t)$	$x_2[n] = \cos(2\pi f_2 n)$
$f_3 = 1.4$	$x_3(t) = \cos(2\pi f_3 t)$	$x_3[n] = \cos(2\pi f_3 n)$
$f_4 = 1.6$	$x_4(t) = \cos(2\pi f_4 t)$	$x_4[n] = \cos(2\pi f_4 n)$

$x_1[n]$, $x_2[n]$, $x_3[n]$, and $x_4[n]$ are the point sampling of $x_1(t)$, $x_2(t)$, $x_3(t)$, and $x_4(t)$.

Use Matlab for the following questions.
(t=0:0.01:10 and n=0:1:10)

(a) Plot $x_1(t)$ and $x_1[n]$ in figure 1.
(b) Plot $x_2(t)$ and $x_2[n]$ in figure 2.
(c) Plot $x_3(t)$ and $x_3[n]$ in figure 3.
(d) Plot $x_4(t)$ and $x_4[n]$ in figure 4.
(e) Plot $x_1(t)$, $x_2(t)$, $x_3(t)$, and $x_4(t)$ in figure 5.
(f) Plot $x_1[n]$, $x_2[n]$, $x_3[n]$, and $x_4[n]$ in figure 6.
(g) Observe (e) and (f), and discuss it.

Problem 2

Please derive how to obtain the following two transforms and inverse transforms.

(a) $x(t) = \frac{1}{T}\sum_{k=-\infty}^{+\infty} X[k] e^{+j\frac{k2\pi t}{T}}$ $\qquad$ $X[k] = \int_0^T x(t) e^{-j\frac{k2\pi t}{T}} dt$

(b) $x(t) = \int_{-\infty}^{+\infty} X(f) e^{+j2\pi ft} df$ $\qquad$ $X(f) = \int_{-\infty}^{+\infty} x(t) e^{-j2\pi ft} dt$