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# -----QUESTION 14

## Table of Contents

(14i) Fourier sine and cosine transformation .....	1
(14ii) fourier .....	1
(14iii) fourier .....	2

## (14i) Fourier sine and cosine transformation

```
syms x
a= sin(x.^2)/x;
b = fourier(a)
pretty(b)

% fourier inverse
syms w
c = fourier(sin(x^2)/x, x, w);
inverse = ifourier(c)
pretty(inverse)
```

*b =*

*fourier(sin(x^2)/x, x, w)*

*fourier* 
$$\frac{\int \sin(x^2) dx}{x}, x, w$$

*inverse =*

*sin(x^2)/x*

$$\frac{\sin(x^2)}{x}$$

## (14ii) fourier

```
syms a w
f = x*(a^2-x^2);
ans = fourier(f)
pretty(ans)
```

```
% inverse
syms w a;
c = pi*dirac(1, w)*a^2*2i + pi*dirac(3, w)*2i
inverse = ifourier(c)
pretty(inverse)
```

ans =

$\pi \operatorname{dirac}(1, w) a^2 2i + \pi \operatorname{dirac}(3, w) 2i$

$\pi \operatorname{dirac}'(w) a^2 2i + \pi \operatorname{dirac}'''(w) 2i$

c =

$\pi \operatorname{dirac}(1, w) a^2 2i + \pi \operatorname{dirac}(3, w) 2i$

inverse =

$-(-2\pi a^2 x + 2\pi x^3)/(2\pi i)$

$$-\frac{\pi a^2 x^2 + 2\pi x^3}{2\pi i}$$

## (14iii) fourier

```
syms k x
f = cos(k*x);
ans = fourier(f)
pretty(ans)
```

```
% inverse
syms k m
c = pi*(dirac(k - w) + dirac(k + w))
inverse = ifourier(c)
pretty(inverse)
```

ans =

$\pi (\operatorname{dirac}(k - w) + \operatorname{dirac}(k + w))$

$\pi (\operatorname{dirac}(k - w) + \operatorname{dirac}(k + w))$

c =

$\pi (\operatorname{dirac}(k - w) + \operatorname{dirac}(k + w))$

*inverse* =

$\exp(-k*x*1i)/2 + \exp(k*x*1i)/2$

$$\frac{\exp(-k \times 1i)}{2} + \frac{\exp(k \times 1i)}{2}$$

*Published with MATLAB® R2022b*