

4.1 微分・積分

問題A

1 (1) $f(x) = \tan x = \frac{\sin x}{\cos x}$

$f'(x) = \frac{1}{\cos^2 x} \rightarrow f'(0) = 1$

接線 $y - 0 = 1 \times (x - 0) \therefore y = x$

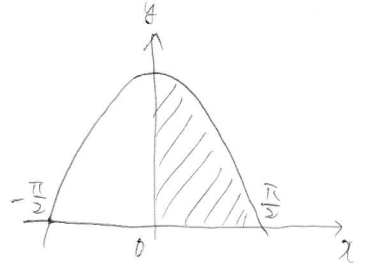
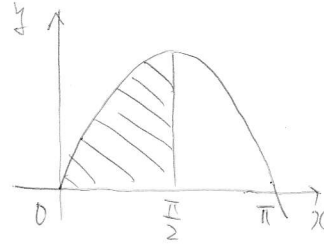
(2) $f(x) = \sin x \rightarrow f(0) = 0$

$f'(x) = \cos x \rightarrow f'(0) = 1$

接線 $y - 0 = 1 \times (x - 0) \therefore y = x$

2 (1) $\int_0^{\frac{\pi}{2}} \sin x dx = -\cos x \Big|_0^{\frac{\pi}{2}} = 1$

(2) $\int_0^{\frac{\pi}{2}} \cos x dx = \sin x \Big|_0^{\frac{\pi}{2}} = 1$

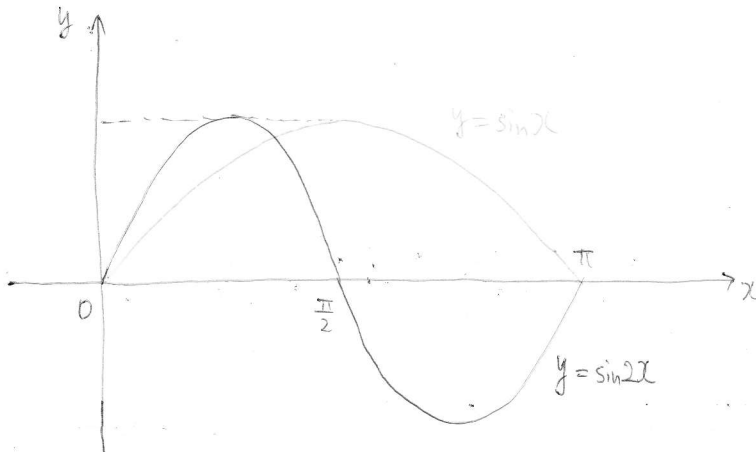


3 (1) $y = \sin 2x$

$y' = 2 \cos 2x$

$y'' = -4 \sin 2x$

x	0	...	$\frac{\pi}{4}$	...	$\frac{\pi}{2}$	...	$\frac{3}{4}\pi$	...	π
y'	+	+	0	-	-	-	0	+	+
y''	0	-	-	-	0	+	+	+	0
y	0	↗	↑	↘	0	↙	↓	↗	0

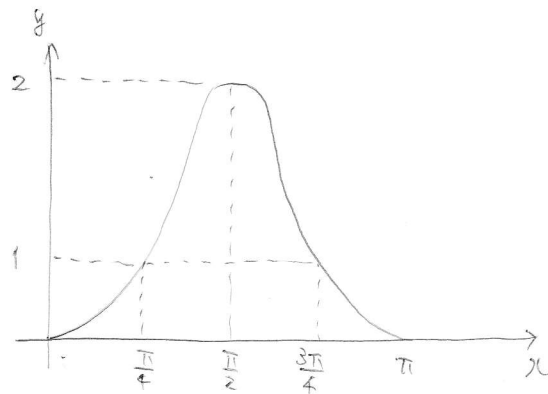


$$(2) y = \sin^2 x$$

$$y' = 2 \sin x \cos x$$

$$y'' = 2 \cos^2 x - 2 \sin^2 x$$

x	0	...	$\frac{\pi}{4}$	...	$\frac{\pi}{2}$	...	$\frac{3}{4}\pi$	...	π
y'	0	+	+	+	0	-	-	-	0
y''	+	+	0	-	-	-	0	+	+
y	0	↗	$\frac{1}{2}$	↗	1	↘	$\frac{1}{2}$	↘	0



問題 B

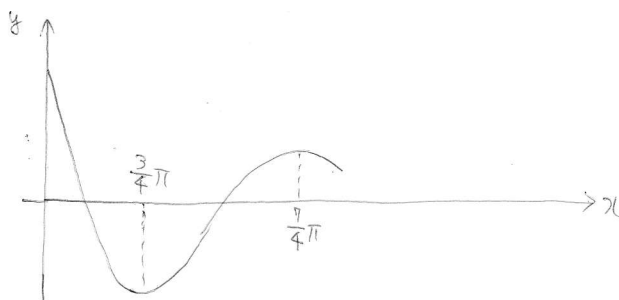
$$(1) y = e^{-x} \cos x$$

$$y' = -e^{-x} (\cos x + \sin x)$$

$$y'' = e^{-x} (\cos x + \sin x + \sin x - \cos x)$$

$$= 2e^{-x} \sin x$$

x	0	...	$\frac{3}{4}\pi$	...	π	...	$\frac{7}{4}\pi$	...	2π
y'	-	-	0	+	+	+	0	-	-
y''	0	+	+	+	0	-	-	-	0
y	1	↘	$-\frac{e^{-3\pi/4}}{\sqrt{2}}$	↗	$-e^{-\pi}$	↗	$\frac{e^{-7\pi/4}}{\sqrt{2}}$	↘	$e^{-2\pi}$



$$(2) y = e^{-x} \sin x$$

$$y' = e^{-x} (-\sin x + \cos x)$$

$$y'' = e^{-x} (\sin x - \cos x - \cos x - \sin x)$$

$$= -2e^{-x} \cos x$$

x	0	...	$\frac{\pi}{4}$	...	$\frac{\pi}{2}$	...	$\frac{5}{4}\pi$	...	$\frac{3}{2}\pi$	...	2π
y'	+	+	0	-	-	-	0	+	+	+	+
y''	-	-	-	-	0	+	+	+	0	-	-
y	0	↗	$\frac{e^{-\pi/4}}{\sqrt{2}}$	↘	$e^{-\pi/2}$	↘	$-\frac{e^{-5\pi/4}}{\sqrt{2}}$	↗	$-e^{-3\pi/2}$	↗	0

