IB$_2$ **Test 2** Friday 31 Oct 2025

Subject : *Antiderivatives & Integrals* Name: _____

Tot: /31

Problem 1 [12 marks]

Find the following *antiderivatives*

1) $\int (3\cos(x) - 4\sin(4x))\,dx$

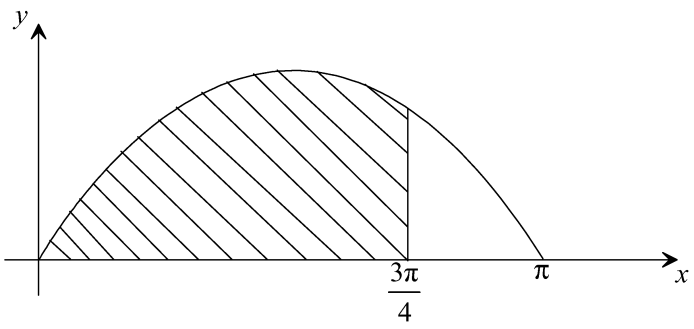
2) $\int \cos(x^3+1)3x^2\,dx$

3) $\int 3e^{\ln(x)} \cdot \frac{1}{x}\,dx$

4) $\int \left(\frac{16}{x^5} - \frac{4}{x^3} - \frac{2}{x}\right)dx$

Problem 2 (IB Paper1 question) [6 marks]

The diagram shows part of the curve $y = \sin x$. The shaded region is bounded by the curve and the lines $y = 0$ and $x = \frac{3\pi}{4}$.



Given that $\sin\frac{3\pi}{4} = \frac{\sqrt{2}}{2}$ and $\cos\frac{3\pi}{4} = -\frac{\sqrt{2}}{2}$, calculate the **exact** area of the shaded region.

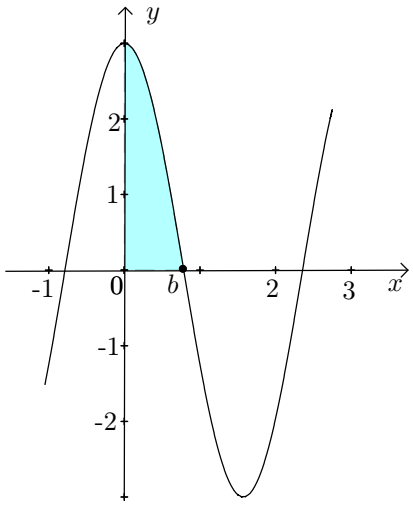
Problem 3 [14 marks]

Give the **exact** expression for the area of the 3 surfaces below

1) $f(x) = 3\cos(2x)$

$a = 0$

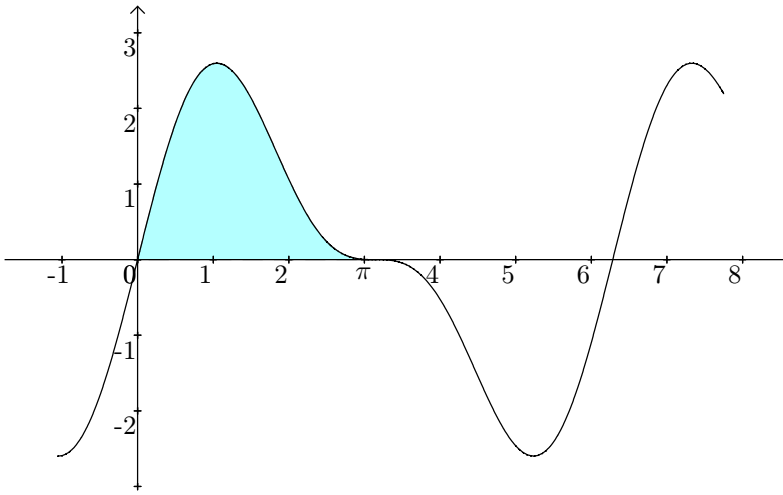
$b > 0$: first intersection with the $x-$axis



2) $f(x) = \sin(2x) + 2\sin(x)$

$a = 0$

$b = \pi$



3)

i) Find the derivative of
$F(x) = x\,(\ln(x) - 1)$

ii) Hence explain why
$F(x) + c$ is an antiderivative
of $f(x) = \ln(x)$

iii) Show <u>that</u> the area under
the curve $y = \ln(x)$
for $a < x < b$
with $a = 1$
$b = e$
(as shown on the picture)
<u>is</u> 1.