Name: _____ *key* _____ V2

Name: _____

Name: _____

Work in groups of THREE and hand in one quiz per group.

You may use your hand-written Notebooks but no other materials and no technology at all. Please keep your discussions quiet so as not to disturb or inform other groups.

1. Use algebra and integration techniques to solve the integral below. Show all work clearly and in order and be sure to check your work along the way for errors.

$$\int \frac{5x^2 + x - 3}{(2x+1)(x^2+2)}\, dx$$

P.F.

want $\dfrac{5x^2 + x - 3}{(2x+1)(x^2+2)} = \dfrac{A}{2x+1} + \dfrac{Bx+c}{x^2+2}$

$5x^2 + x - 3 = A(x^2+2) + (Bx+c)(2x+1)$

$5x^2 + x - 3 = (A+2B)x^2 + (B+2C)x + (2A+C)$

$\begin{cases} A+2B = 5 \\ B+2C = 1 \\ 2A+C = -3 \end{cases} \Rightarrow \begin{cases} A = 5-2B \\ C = \dfrac{1-B}{2} \\ 2(5-2B) + \left(\dfrac{1-B}{2}\right) = -3 \end{cases}$

$\Rightarrow A = 5 - 2\cdot3 = -1$

$\Rightarrow C = \dfrac{1-3}{2} = -1$

$10 - 4B + \dfrac{1}{2} - \dfrac{B}{2} = -3$

$20 - 8B + 1 - B = -6$

$21 - 9B = -6 \Rightarrow -9B = -27 \Rightarrow B = 3$

So $\displaystyle\int \frac{5x^2+x-3}{(2x-1)(x^2+2)}\, dx = \int\left(\frac{-1}{2x+1} + \frac{3x-1}{x^2+2}\right)dx$

$= -\int \frac{1}{2x+1}\,dx + 3\int \frac{x}{x^2+2}\,dx - \int \frac{1}{x^2+2}\,dx$

$u = x^2+2$
$du = 2x\,dx$
$\frac{1}{2}du = x\,dx$

$= -\frac{1}{2}\ln|2x+1| + 3\cdot\frac{1}{2}\int \frac{1}{u}\,du - \int \frac{1}{\left(\frac{x}{\sqrt{2}}\right)^2+1}\left(\frac{1}{2}\right)dx$

$= -\frac{1}{2}\ln|2x+1| + \frac{3}{2}\ln|x^2+2| - \frac{1}{2}\sqrt{2}\,\tan^{-1}\left(\frac{x}{\sqrt{2}}\right) + C$