Practice Quiz 1

2) Partial Fractions

$$\frac{19x^2 - 16x + 8}{5x^3 - 2x^2 + 5x - 2} = \frac{19x^2 - 16x + 8}{x^2(5x-2) + 5x - 2}$$

$$= \frac{19x^2 - 16x + 8}{(x^2+1)(5x-2)}$$

$$= \frac{A}{5x-2} + \frac{Bx+C}{x^2+1}$$

$$\Rightarrow \quad Ax^2 + A + 5Bx^2 + 5Cx - 2Bx - 2C = 19x^2 - 16x + 8$$

$$\Rightarrow \quad \left.\begin{array}{l} A + 5B = 19 \\ 5C - 2B = 16 \\ A - 2C = 8 \end{array}\right\} \Rightarrow A = 4,\ B = 3,\ C = -2$$

(use 2 substitutions, or a matrix)

$$\Rightarrow \quad y = \int \frac{4}{5x-2} + \frac{3x}{x^2+1} - \frac{2}{x^2+1}\, dx$$

$$= \frac{4}{5}\ln|5x-2| + \frac{3}{2}\ln|x^2+1| - 2\tan^{-1}x + C$$
