Date: _____

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

$$\int \left(\frac{A}{x-2} + \frac{B}{x+5} \right) dx =$$

$$\int \frac{Ax + 5A + Bx - B\cdot 2}{(x-2)(x+5)}\,dx =$$

$$x(A+B) + (5A - 2B)$$

$$\begin{cases} A+B=2 \\ 5A-2B=3 \end{cases} \Rightarrow \begin{matrix} A=1 \\ B=1 \end{matrix}$$

$$\int \left(\frac{1}{x-2} + \frac{1}{x+5} \right) dx =$$

$$= \ln|x-2| + \ln|x+5| + C$$

Date: _____

2. $\int e^{2x}\cos 3x\,dx =$

$$\begin{cases} u = \cos 3x \\ dv = e^{2x}dx \end{cases} \Rightarrow \begin{matrix} du = -3\sin(3x)\,dx \\ v = e^{2x}/2 \end{matrix}$$

$$= \frac{1}{2}e^{2x}\cos(3x) + \frac{3}{2}\int e^{2x}\sin(3x)\,dx =$$

$$\begin{cases} u = \sin(3x) \\ dv = e^{2x}dx \end{cases} \Rightarrow \begin{matrix} du = 3\cos(3x)\,dx \\ v = e^{2x}/2 \end{matrix}$$

$$= \frac{3}{4}e^{2x}\sin(3x) + \frac{1}{2}e^{2x}\cos(3x) - \frac{9}{4}\boxed{\int e^{2x}\cos(3x)\,dx}$$

$$= \frac{3}{13}e^{2x}\sin(3x) + \frac{2}{13}e^{2x}\cdot\cos(3x) + C$$

$$= \frac{e^{2x}}{13}\left(3\sin(3x) + 2\cos(3x)\right) + C$$

Date: _____

3. $\int_0^{\ln 2} x e^{-x} dx =$

$$\begin{bmatrix} u = x & \Rightarrow & du = dx \\ dv = e^{-x} & & v = -e^{-x} \end{bmatrix}$$

$$= \left(-e^{-x} \cdot x\right)\Big|_0^{\ln 2} + \int_0^{\ln 2} e^{-x} dx =$$

$$= -\frac{\ln 2}{2} + \frac{1}{2} = \frac{1 - \ln 2}{2}$$