Cal II Lab 1.

1. $\int \frac{2}{x-5} + \int \frac{1}{3x+2} dx$ $u = 3x+2$ $\frac{du}{dx} = 3$ $dx = \frac{du}{3}$

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

2. $\int \frac{1}{(4x-3)^2} dx$

$u = 4x-3 \quad \frac{du}{dx} = 4 \quad dx = \frac{du}{4}$

$\int \frac{1}{u^2} \frac{du}{4} = \frac{1}{4} \int u^{-2} du = \frac{1}{4} \frac{u^{-1}}{-1} + C$

$= -\frac{1}{4} \frac{1}{u} + C = \boxed{-\frac{1}{4} \cdot \frac{1}{4x-3} + C}$

3. $\int 6x \, e^{x^2+4} dx$

$u = x^2+4 \quad \frac{du}{dx} = 2x \quad dx = \frac{du}{2x}$

$\int 6x \, e^u \frac{du}{2x} = \int 3 e^u du$

$= 3 e^u + C = \boxed{3 e^{x^2+4} + C}$

#4

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

$$u = 3x-2 \qquad \frac{du}{dx} = 3 \qquad dx = \frac{du}{3}$$

$$\int \frac{3}{\sqrt{1-u^2}} \cdot \frac{du}{3}$$

$$= \int \frac{1}{\sqrt{1-u^2}} \, du = \sin^{-1} u + C = \boxed{\sin^{-1}(3x-2) + C}$$

#5

$$\int \frac{1}{4+25x^2} \, dx$$

$$= \int \frac{1}{4\left(1 + \frac{25x^2}{4}\right)} \, dx = \frac{1}{4} \int \frac{1}{1+\left(\frac{5x}{2}\right)^2} \, dx$$

$$u = \frac{5x}{2} \qquad \frac{du}{dx} = \frac{5}{2} \qquad dx = \frac{2}{5} \, du$$

$$= \frac{1}{4} \int \frac{1}{1+u^2} \, \frac{2}{5} \, du = \frac{1}{10} \int \frac{1}{1+u^2} \, du$$

$$= \frac{1}{10} \tan^{-1} u + C = \boxed{\frac{1}{10} \tan^{-1}\left(\frac{5x}{2}\right) + C}$$