1) $\int \frac{8x^3 - 16x}{(2x^2 - 4)^2} \, dx$

2) $\int 42 \cdot \sin(4x) \cdot \cos(4x) \, dx$

3) $\int \frac{1}{2} x^2 \cdot \cos(2x) \, dx$

4) $\int_0^{\pi/2} (e^x)^4 \cdot \sin(2x) \, dx$

5) $\int_0^{4\pi} x \cdot \frac{4}{3} \cos(-\frac{1}{4} x) \, dx$

Klausuren ?

1) $\int \frac{8x^3 - 16x}{(2x^2-4)^2}$ $\cdot \frac{1}{2}$

$\hookrightarrow{}'$ $2 \cdot (2x^2-4) \cdot 4x = 16x^3 - 32x$

$\frac{1}{2} \int \frac{16x^3 - 32x}{(2x^2-4)^2} \Rightarrow \frac{1}{2} \cdot \ln(2x^2-4)^2 = \ln(2x^2-4) + C$

$+C$

2) $\boxed{42} \int \cdot \sin(4x) \cdot \cos(4x) = 42 \cdot \frac{1}{4} \cdot \int \sin(4x) \cdot 4 \cdot \cos(4x)$

$[\sin(4x)]' = \underline{4} \cdot \cos(4x)$

$42 \cdot \frac{1}{4} \cdot \frac{1}{2} \cdot [\sin(4x)]^2$

$\frac{21}{4} \cdot [\sin(4x)]^2$

$42 \cdot \int \sin(4x) \cdot \cos(4x)$

$f'(x) = \cos(4x)$ $\qquad$ $f(x) = 1/4 \sin(4x)$

$g(x) = \sin(4x)$ $\qquad$ $g'(x) = 4 \cdot \cos(4x)$

$$\int \sin(4x) \cdot \cos(4x) = 1/4 \cdot \sin(4x) \cdot \sin(4x) - \int 1/4 \sin(4x) \cdot 4 \cos(4x)$$

$$2 \cdot \int \sin(4x) \cdot \cos(4x) = 1/4 \cdot \sin^2(4x) \qquad | : 2$$

$$\int \sin(4x) \cdot \cos(4x) = 1/8 \cdot \sin^2(4x)$$

$$\int 42 \cdot \sin(4x) \cdot \cos(4x) = 42/8 \cdot \sin^2(4x)$$

3) $\int \frac{1}{2} \cdot x^2 \cdot \cos(2x)\, dx$

$f'(x) = \cos(2x)$ $\qquad$ $f(x) = \frac{1}{2} \sin(2x)$

$g(x) = \frac{1}{2} x^2$ $\qquad$ $g'(x) = x$

$\frac{1}{4} x^2 \cdot \sin(2x) - \frac{1}{2} \cdot \int x \cdot \sin(2x)$

$f'(x) = \sin(2x)$ $\qquad$ $f(x) = -\frac{1}{2} \cdot \cos(2x)$

$g(x) = x$ $\qquad$ $g'(x) = 1$

$-\frac{1}{2} \cdot \cos(2x) + \frac{1}{2} \cdot \int \cos(2x)$

$-\frac{1}{2} \cdot \cos(2x) + \frac{1}{4} \cdot \sin(2x)$

$F(x) = \frac{1}{4} x^2 \sin(2x) + \frac{1}{4} \cos(2x) - \frac{1}{8} \sin(2x) + C$

$$\int_0^{\pi/2} e^{4x} \cdot \sin(2x)\, dx$$

I. $f'(x) = \sin(2x)$ $\quad f(x) = -\frac{1}{2} \cdot \cos(2x)$

$g(x) = e^{4x}$ $\quad g'(x) = 4 \cdot e^{4x}$

$$-\frac{1}{2} \cdot e^{4x} \cdot \cos(2x) + 2 \cdot \int e^{4x} \cdot \cos(2x)$$

II. $f'(x) = \cos(2x)$ $\quad f(x) = \frac{1}{2} \cdot \sin(2x)$

$g(x) = e^{4x}$ $\quad g'(x) = 4 \cdot e^{4x}$

$$\frac{1}{2} e^{4x} \cdot \sin(2x) - 2 \cdot \int e^{4x} \cdot \sin(2x)$$

$$\int e^{4x} \cdot \sin(2x) = -\frac{1}{2} \cdot e^{4x} \cdot \cos(2x) + 2 \cdot \left[\frac{1}{2} e^{4x} \sin(2x) - 2 \cdot \int e^{4x} \cdot \sin(2x)\right]$$

$$\int e^{4x}\cdot\sin(2x) = -\tfrac{1}{2}e^{4x}\cdot\cos(2x) + e^{4x}\cdot\sin(2x) - 4\cdot\int e^{4x}\cdot\sin(2x)$$

$$5\cdot\int e^{4x}\cdot\sin(2x) = -\tfrac{1}{2}e^{4x}\cdot\cos(2x) + e^{4x}\cdot\sin(2x)$$

$$F(x) = \tfrac{1}{5}\cdot e^{4x}\left(\sin(2x) - \tfrac{1}{2}\cdot\cos(2x)\right)$$

$$F(\pi/2) = \tfrac{1}{5}\cdot e^{2\pi}\cdot\left(\underbrace{\sin(\pi)}_{0} - \tfrac{1}{2}\cdot\underbrace{\cos(\pi)}_{-1}\right)$$

$$= \tfrac{1}{10}e^{2\pi}$$

$$F(0) = \tfrac{1}{5}\cdot e^{0}\cdot\left(\underbrace{\sin(0)}_{0} - \tfrac{1}{2}\cdot\underbrace{\cos(0)}_{1}\right)$$

$$= -\tfrac{1}{10}$$

$$\Rightarrow \tfrac{1}{10}e^{2\pi} - \left(-\tfrac{1}{10}\right) = \tfrac{1}{10}\cdot\left(e^{2\pi}+1\right)$$