

$$1) \quad f(x) = x^3 - 3x^2 - 4x = x \cdot (x^2 - 3x - 4) = x \cdot (x-4)(x+1)$$

$$\int_{-1}^0 f(x) dx + \int_0^4 f(x) dx = (0 - (-3/4)) + (-32 - 0)$$

$$F(x) = 1/4 x^4 - x^3 - 2x^2$$

$$F(-1) = 1/4 + 1 - 2 = -3/4$$

$$F(0) = 0$$

$$F(4) = 4^3 - 4^3 - 2 \cdot 4^2 = -32$$

$$2) \quad a) \quad 7x - 2 \cdot e^{3x-4} = f(x)$$

$$F(x) = 7/2 x^2 - 2/3 e^{3x-4} + C$$

$$-2 \int e^{3x-4} dx \quad \xrightarrow{3x-4=z}$$

$$-2 \int e^z \frac{dz}{3}$$

$$-2/3 \int e^z dz$$

$$-2/3 e^z$$

$$2) \text{ b) } 4 \cdot (5-3x)^3 = f(x)$$

$$F(x) = \left[-\frac{1}{3}\right] (5-3x)^4 + C$$

$$T(x) = (5-3x)^4$$

$$T'(x) = -12 \cdot (5-3x)^3$$

Lin

$$\infty \cdot \emptyset \begin{array}{l} \nearrow e^x \cdot \frac{1}{x} = \\ [e^x]' = e^x \quad [1/x]' = -1/x^2 \rightarrow \infty \end{array}$$

$$\searrow e^{x+1} \cdot \frac{1}{e^x} \rightarrow e^2$$

$$\searrow x \cdot \frac{1}{e^x} \rightarrow \emptyset$$

3) a)

$$\frac{1}{x^2} = \frac{1}{x} \quad | \uparrow^{(-1)}$$

$$x^1 = x \quad | -x$$

$$x^2 - x = x \cdot (1-1) = 0$$

$\leftarrow \textcircled{1}$   
 $x_1 = 0$   
 $x_2 = 1$

$$\int_0^1 \left( \frac{1}{x} - \frac{1}{x^2} \right) dx = \left[ \ln|x| + \frac{1}{x} \right]_0^1 = |1 - \infty| = \infty$$

$$F(1) = \ln(1) + 1 = 0 + 1 = 1$$

$$F(0) = \lim_{x \rightarrow 0} \left[ \underbrace{\ln(x)}_{-\infty} + \underbrace{\frac{1}{x}}_{\infty} \right] = \infty$$

$\downarrow$   
 $\frac{1}{x} - \frac{1}{x^2}$

$$\begin{aligned}
 6) \quad \sqrt{5x-6} &= x \quad | \uparrow^2 \\
 5x-6 &= x^2 \quad (-5x+6) \\
 0 &= x^2 - 5x + 6 = (x-2)(x-3) \\
 & \quad x_1 = 2 \quad \vee \quad x_2 = 3
 \end{aligned}$$

$$\int_2^3 x - \sqrt{5x-6} \, dx$$

$$F(x) = \frac{1}{2}x^2 - \frac{2}{15} \cdot (5x-6)^{3/2}$$

$$F(3) = \frac{9}{2} - \frac{2}{15} \cdot (\sqrt{9})^3 = \frac{9}{2} - \frac{18}{5} = \frac{9}{10}$$

$$F(2) = 2 - \frac{2}{15} \cdot (\sqrt{4})^3 = 2 - \frac{16}{15} = \frac{14}{15}$$

$$\left| \frac{27}{30} - \frac{28}{30} \right| = \frac{1}{30} \quad \overline{FC}$$

$$\sqrt{5x-6} = (5x-6)^{1/2}$$

$$T(x) = (5x-6)^{3/2}$$

$$T'(x) = \frac{3}{2} \cdot 5 \cdot (5x-6)^{1/2}$$

$$4) \text{ a) } \int (x^2 \cdot e^{3x-4}) dx$$

$$f'(x) = e^{3x-4}$$

$$f(x) = \frac{1}{3} e^{3x-4}$$

$$g(x) = x^2$$

$$g'(x) = 2x$$

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

$$f'(x) = e^{3x-4}$$

$$f(x) = \frac{1}{3} e^{3x-4}$$

$$g(x) = x$$

$$g'(x) = 1$$

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

$$F(x) = 2 \cdot \left[ \frac{1}{3} x^2 e^{3x-4} - \frac{2}{3} \left( \frac{1}{3} x e^{3x-4} - \frac{1}{9} e^{3x-4} \right) \right]$$

$$\frac{2}{3} x^2 e^{3x-4} - \frac{4}{9} x e^{3x-4} + \frac{4}{27} e^{3x-4} + C$$

$$= e^{3x-4} \cdot \left( \frac{2}{3} x^2 - \frac{4}{9} x + \frac{4}{27} \right) + C$$

$$b) \int \frac{4 \cdot \cos(5-3x)}{e^{2x}} dx = 4 \cdot \int \cos(5-3x) \cdot e^{-2x} dx$$

$$f'(x) = e^{-2x}$$

$$f(x) = -\frac{1}{2} e^{-2x}$$

$$g(x) = \cos(5-3x)$$

$$g'(x) = 3 \cdot \sin(5-3x)$$

$$-\frac{1}{2} e^{-2x} \cdot \cos(5-3x) + \frac{3}{2} \int e^{-2x} \cdot \sin(5-3x) dx$$

$$\int e^{-2x} \sin(5-3x) dx$$

$$f'(x) = e^{-2x}$$

$$f(x) = -\frac{1}{2} e^{-2x}$$

$$g(x) = \sin(5-3x)$$

$$g'(x) = -3 \cdot \cos(5-3x)$$

$$-\frac{1}{2} e^{-2x} \sin(5-3x) - \frac{3}{2} \cdot \underbrace{\int e^{-2x} \cos(5-3x) dx}_r$$

$$4 \cdot r = -\frac{1}{2} e^{-2x} \cdot \cos(5-3x) + \frac{3}{2} \cdot \left[ -\frac{1}{2} e^{-2x} \sin(5-3x) - \frac{3}{2} r \right]$$

$$4r = -\frac{1}{2} e^{-2x} \cos(5-3x) - \frac{3}{4} e^{-2x} \sin(5-3x) - \frac{9}{4} r \quad | + \frac{9}{4} r$$

$$\frac{25}{4} r = -e^{-2x} \cdot \left( \frac{1}{2} \cos(5-3x) + \frac{3}{4} \sin(5-3x) \right) \quad \text{FALSCH !}$$

$$\int e^{-2x} \cdot \cos(5-3x) dx = -\frac{4}{25} e^{2x} \cdot \left( \frac{1}{2} \cos(5-3x) + \frac{3}{4} \sin(5-3x) \right) + C$$

$$4. \int e^{-2x} \cdot \cos(5-3x) dx =$$

$$4. \left[ -\frac{1}{2} e^{-2x} \cos(5-3x) - \frac{3}{4} e^{-2x} \cdot \sin(5-3x) - \frac{9}{14} \int e^{-2x} \cos(5-3x) dx \right]$$

$$4. \int \dots dx = -\frac{1}{2} e^{-2x} \cos(5-3x) - \frac{3}{4} e^{-2x} \cdot \sin(5-3x) - \frac{9}{14} \int \dots dx$$

$$13 \int \dots dx = -e^{-2x} \cdot (2 \cos(5-3x) + 3 \cdot \sin(5-3x))$$

$$\int \dots dx = -\frac{1}{13 e^{2x}} \cdot (2 \cdot \cos(5-3x) + 3 \cdot \sin(5-3x)) + C$$

RICHTIG

$$5) a) \int (x \cdot \sqrt{1-x^2}) dx$$

$$u(x) = 1-x^2$$

$$u'(x) = -2x$$

$$\int x \cdot \sqrt{u} \cdot \frac{du}{-2x} = -\frac{1}{2} \int \sqrt{u} du$$

$$\sqrt{u} = u^{1/2} \rightarrow F(u) = \frac{2}{3} u^{3/2} = \frac{2}{3} \sqrt{u^3}$$

$$F(x) = -\frac{1}{2} \cdot \left[ \frac{2}{3} \sqrt{(1-x^2)^3} \right] = -\frac{1}{3} \sqrt{(1-x^2)^3} + C$$

$$b) \int_1^2 \frac{u}{e^{2x-4}} dx$$

$$u(x) = 2x-4$$

$$u'(x) = 2$$

$$4 \cdot \int_{-2}^0 e^{-u} \frac{du}{2} = 2 \left[ -e^{-u} \right]_{-2}^0 = 2 \cdot | -1 - e^2 |$$

$$\Leftrightarrow 2 + 2e^2$$

$$\int_{x=0}^{3/2} \int_{y=1/2}^1 (x \cdot e^{y+x^2}) dy dx$$

$$\underbrace{x \cdot e^{x^2}}_{\text{constant}} \cdot \int_{y=1/2}^1 e^y dy \rightarrow F(y) = e^y$$

$$x \cdot e^{x^2} \cdot (e^1 - e^{1/2})$$

$$u(x) = x^2 \\ u'(x) = 2x$$

$$(e - \sqrt{e}) \cdot \int_{x=0}^{3/2} (x \cdot e^{x^2}) dx$$

$$(e - \sqrt{e}) \cdot \int_0^{3/2} x \cdot e^u \cdot \frac{du}{2x} = \frac{1}{2} \cdot (e - \sqrt{e}) \cdot \int_0^{3/2} e^u du$$

$$\frac{1}{2} \cdot (e - \sqrt{e}) \cdot [e^{x^2}]_0^{3/2} = \frac{1}{2} \cdot (e - \sqrt{e}) \cdot [e^{9/4} - 1]$$