D. 1. $\int \frac{1}{x^2+4x+5}$ 2. $\int_{2\pi/3}^{3\pi/4} \tan x \; dx$
3. $y=2x$ és $y=\sqrt[6]{x}$ közti terület. 4. $\int_{\sqrt{3}}^{\infty} \frac{x}{2e^x} \; dx$

Megoldások vázlata:
D1.

$$\begin{aligned}\int \frac{1}{x^2+4x+5} &= \int \frac{1}{x^2+4x+4+1}\\ &= \int \frac{1}{(x+2)^2+1} && (\text{ 2 pont })\\ &= \arctan(x+2) && (\text{ 3 pont })\end{aligned}$$

D2. $y=\cos x$ helyettesítéssel:

$$\begin{aligned}\int \tan x \; dx &= \int \frac{\sin x}{\cos x} \; dx\\ &= \int \frac{\sin x}{y} \cdot \frac{dy}{-\sin x} = -\int y^{-1} dy\\ &= -\log|\cos x| && (\text{ 2 pont })\\ \int_{2\pi/3}^{3\pi/4} \tan x \; dx &= [-\log|\cos x|]_{2\pi/3}^{3\pi/4} && (\text{ 1 pont })\\ \cos\frac{3\pi}{4} &= \frac{-1}{\sqrt{2}} \qquad \cos\frac{2\pi}{3} = \frac{-1}{2} && (\text{ 1 pont })\\ \int_{2\pi/3}^{3\pi/4} \tan x \; dx &= -\log\frac{1}{\sqrt{2}} + \log\frac{1}{2} = -\log\sqrt{2} && (\text{ 1 pont })\end{aligned}$$

D3.

$$\begin{aligned}2x &= x^{1/6}\\ x &= 0 \text{ és } x = \frac{1}{2\cdot\sqrt[5]{2}} = 2^{-1.2} && (\text{ 1 pont })\\ \int \left(x^{1/6}-2x\right) &= \frac{6x^{7/6}}{7} - x^2 && (\text{ 1 pont })\\ \int_0^{2^{-1.2}} \left(x^{1/6}-2x\right) \; dx &= \left[\frac{6x^{7/6}}{7} - x^2\right]_0^{2^{-1.2}} && (\text{ 1 pont })\\ &= \frac{6\cdot\left(2^{-6/5}\right)^{7/6}}{7} - \left(2^{-6/5}\right)^2 && (\text{ 1 pont })\\ &= \frac{5}{28\sqrt[5]{4}} && (\text{ 1 pont })\end{aligned}$$

D4.

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\begin{aligned}
\int \frac{x}{2e^x} &= \frac{1}{2}\int xe^{-x} = \frac{1}{2}\left(x\cdot\frac{e^{-x}}{-1} - \int \frac{e^{-x}}{-1}\right)\\
&= \frac{-1-x}{2e^x} \qquad (\text{ 2 pont })\\
\int_{\sqrt{3}}^{b} \frac{x}{2e^x}\,dx &= \left[\frac{-1-x}{2e^x}\right]_{\sqrt{3}}^{b} = \frac{-(1+b)}{2e^b} + \frac{1+\sqrt{3}}{2e^{\sqrt{3}}}\\
& \qquad\qquad (\text{ 1 pont })\\
\lim_{b\to\infty} \frac{1+b}{e^b} &= \lim_{b\to\infty} \frac{1}{e^b} = 0 \qquad (\text{ 1 pont })\\
\int_{\sqrt{3}}^{\infty} \frac{x}{2e^x}\,dx &= \frac{1+\sqrt{3}}{2e^{\sqrt{3}}} \qquad (\text{ 1 pont })
\end{aligned}
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