A. Vyšetřete konečnost integrálů.

$$1.\ \int\limits_0^\infty \frac{\sqrt[3]{x}+3}{\sqrt{x}+2}\,dx \qquad 2.\ \int\limits_0^1 \frac{\sin(\pi x)}{x^{9/8}\ln x}\,dx \qquad 3.\ \int\limits_0^\infty \frac{\ln(x+1)}{x^{101/100}}\,dx$$

$$*4.\ \int\limits_0^\infty \frac{\sin^2 x}{x^a}\,dx \qquad 5.\ \int\limits_0^\infty \sin^3\left(\frac{1}{\sqrt{x}}\right)dx \qquad 6.\ \int\limits_0^\pi \frac{dx}{\sqrt{\sin x}}$$

$$7.\ \int\limits_0^\infty x\exp(-x)\sin x\,dx \qquad *8.\ \int\limits_0^\infty \frac{x}{1+x^5\sin^2 x}\,dx \qquad 9.\ \int\limits_0^{1/2} \frac{dx}{x\ln^b x}$$

$$10.\ \int\limits_0^\infty \frac{dx}{\exp x-\cos x} \qquad 11.\ \int\limits_0^\infty \frac{\operatorname{arctg} x}{x^a}\,dx \qquad *12.\ \int\limits_0^\infty \frac{p(x)}{q(x)}\,dx$$

B. Vyšetřete spojitost funkce $F(a)$:

$$1.\ \int\limits_0^\infty \frac{\exp(-ax)}{1+x^3}\,dx,\quad a\geq 0 \qquad 2.\ \int\limits_0^\infty \frac{x}{1+x^a}\,dx,\quad a>2$$

$$3.\ \int\limits_0^\pi \frac{\sin x}{x^a(\pi-x)^a}\,dx,\quad a<2 \qquad 4.\ \int\limits_{-1}^1 \sqrt{x^2+a^2},\quad a\in R$$

$$5.\ \int\limits_0^\infty \exp(-ax)\frac{\sin x}{x}\,dx,\quad a>0 \qquad 6.\ \int\limits_1^\infty \frac{\sin\left(\frac{1}{x}\right)}{x(a+x)^2},\quad a>-1$$

C. Derivováním podle parametru spočtěte integrály:

$$1.\ \int\limits_0^\infty \frac{1-\exp(-ax^2)}{x^2\exp(x^2)}\,dx \qquad 2.\ \int\limits_0^1 \frac{x^a-1}{\ln x}\,dx$$

3. $\displaystyle\int\limits_{0}^{\infty} \exp(-x)\frac{\sin(ax)}{x}\,dx$ 4. $\displaystyle\int\limits_{0}^{\infty} \exp(-x)\frac{1-\cos(ax)}{x}\,dx$

5. $\displaystyle\int\limits_{0}^{\infty} \frac{\operatorname{arctg}(ax)}{x(1+x^2)}\,dx$ * 6. $\displaystyle\int\limits_{0}^{\infty} \exp\left\{-x^2 - \frac{a^2}{x^2}\right\}\,dx$

7. $\displaystyle\int\limits_{0}^{\pi/2} \frac{\ln(1+a\sin x)}{\sin x}\,dx$ 8. $\displaystyle\int\limits_{0}^{\pi} \frac{\ln(1+\cos x)}{\cos x}\,dx$