Custom Calculus Test Solutions

Solution to Problem 1

Find the derivative of: $\operatorname{atan}(x)$

$$\frac{1}{x^2+1}$$

Solution to Problem 2

Find the derivative of: e^x

$$e^x$$

Solution to Problem 3

Find the integral of: $\log(\sqrt{x})$

$$\frac{x(\log(x)-1)}{2}+C$$

Solution to Problem 4

Find the integral of: $\sin(x)\cos(x)$

$$\frac{\sin^2(x)}{2}+C$$

Solution to Problem 5

Use U-substitution to find the integral of: $(2x+1)^3$

$$x\left(2x^3+4x^2+3x+1\right)+C$$

Solution to Problem 6

Use integration by parts to find the integral of: xe^x

$$(x-1)e^x+C$$

Solution to Problem 7

Find the integral of the trigonometric function: $\sin(x)\cos(x)$

$$\frac{\sin^2(x)}{2} + C$$

Solution to Problem 8

Use trigonometric substitution to find the integral of: $\sqrt{x^2-1}$

$$\frac{x\sqrt{x^2-1}}{2} - \frac{\operatorname{acosh}(x)}{2} + C$$

Solution to Problem 9

Use partial fractions to find the integral of: $\frac{1}{x(x+1)}$

$$\log(x) - \log(x+1) + C$$

Solution to Problem 10

Find the improper integral of: $\frac{1}{x^2+1}$ from 1 to ∞

$$\frac{\pi}{4}$$

Solution to Problem 11

Find the limit of: $\sin(\pi x)$ as x approaches ∞

$$\langle -1, 1 \rangle$$