Custom Calculus Test Solutions

Solution to Problem 1

Find the derivative of: $\cos(x)$

$$-\sin(x)$$

Solution to Problem 2

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

$$-\cos(x) + C$$

Solution to Problem 3

Use U-substitution to find the integral of: $\sin(2x)$

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

Solution to Problem 4

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

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

Solution to Problem 5

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

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

Solution to Problem 6

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 7

Use partial fractions to find the integral of: $\frac{1}{x^2+1}$

$$\operatorname{atan}(x) + C$$

Solution to Problem 8

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

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

Solution to Problem 9

Find the limit of: $\operatorname{acos}(x)$ as x approaches 0

$$\frac{\pi}{2}$$

Solution to Problem 10

Find the sum of the series: $\sum_{n=0}^{\infty} x^n$

$$\begin{cases} -\frac{1}{x-1} & \text{for } x > -1 \wedge x < 1 \\ \sum_{n=0}^{\infty} x^n & \text{otherwise} \end{cases}$$