# Custom Calculus Test Solutions

## Solution to Problem 1

Find the derivative of: $e^{x}$

$$e^{x}$$

## Solution to Problem 2

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

$$-\sin\left(x\right)$$

## Solution to Problem 3

Find the integral of: $e^{\sin\left(x\right)}$

$$\int e^{\sin\left(x\right)}\,dx + C$$

## Solution to Problem 4

Find the integral of: $\operatorname{acos}\left(x\right)$

$$x\operatorname{acos}\left(x\right) - \sqrt{1-x^{2}} + C$$

## Solution to Problem 5

Use U-substitution to find the integral of: $\left(2x+1\right)^{3}$

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

## Solution to Problem 6

Use integration by parts to find the integral of: $x\log\left(x\right)$

$$\frac{x^{2}\cdot\left(2\log\left(x\right)-1\right)}{4} + C$$

## Solution to Problem 7

Find the integral of the trigonometric function: $\sin^2(x)$

$$\frac{x}{2} - \frac{\sin(2x)}{4} + C$$

## 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 $\infty$

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

## Solution to Problem 11

Find the limit of: $\log(x)$ as $x$ approaches $\infty$

$$\infty$$