

MATH 136
Calculus II

Calculus I Review

A. Limits

Find the following limits:

1. $\lim_{x \rightarrow 3} \sqrt{x^2 - x - 6} =$

2. $\lim_{t \rightarrow -2} \frac{t^2 - 2t - 8}{t^2 - 4} =$

3. $\lim_{x \rightarrow 0} \frac{e^x - 1}{x} =$

4. $\lim_{x \rightarrow \pi} \frac{1 + \cos x}{x} =$

5. $\lim_{x \rightarrow 2} \ln(x - 1) =$

6. $\lim_{x \rightarrow \infty} \frac{3x^3 - x^2 + 5x + 2}{x^4 - 1} =$

7. $\lim_{x \rightarrow 3} \frac{x + 3}{x^2 - 9} =$

8. $\lim_{x \rightarrow 0^+} \ln x =$

9. $\lim_{x \rightarrow -\infty} e^{-x} =$

10. Let $f(x) = \begin{cases} 5 - 2x & x \leq 1 \\ 3 + x & x > 1 \end{cases}$. Find $\lim_{x \rightarrow 1^-} f(x)$.

B. Derivative Rules

Fill in the following derivative rules:

Function:Derivative:

- $y = c$ $\frac{dy}{dx} =$ _____
- $y = cf(x)$ $\frac{dy}{dx} =$ _____
- $y = f(x) \pm g(x)$ $\frac{dy}{dx} =$ _____
- $y = f(x)g(x)$ $\frac{dy}{dx} =$ _____
- $y = \frac{f(x)}{g(x)}$ $\frac{dy}{dx} =$ _____
- $y = f(g(x))$ $\frac{dy}{dx} =$ _____
- $y = \sin x$ $\frac{dy}{dx} =$ _____
- $y = \cos x$ $\frac{dy}{dx} =$ _____
- $y = \tan x$ $\frac{dy}{dx} =$ _____
- $y = \csc x$ $\frac{dy}{dx} =$ _____
- $y = \sec x$ $\frac{dy}{dx} =$ _____
- $y = \cot x$ $\frac{dy}{dx} =$ _____
- $y = \ln x$ $\frac{dy}{dx} =$ _____
- $y = e^x$ $\frac{dy}{dx} =$ _____
- $y = \arcsin x$ $\frac{dy}{dx} =$ _____
- $y = \arctan x$ $\frac{dy}{dx} =$ _____
- $y = \operatorname{arcsec} x$ $\frac{dy}{dx} =$ _____

C. Derivatives

Find the derivatives of the following functions:

1. $f(x) = 5x^4 + 7x^{-3}$

2. $f(x) = 3e^{2x}$

3. $f(x) = \sqrt{x^2 - 1}$

4. $f(x) = 2x - 3\sin x$

5. $f(x) = \ln(x^3 - 5)$

6. $f(x) = \sin x \tan x$

7. $f(x) = \sqrt{x^2 + 4} \cos(3x - 4)$

8. $f(x) = \frac{\tan(x+1)}{x+1}$

9. $g(x) = \arctan(e^x)$

10. $g(x) = \arcsin(\cos(3x - 1))$

D. Integration Rules

Fill in the following Integration Rules, if known.

$$\int k \, dx = \qquad \int \sin x \, dx =$$

$$\int x^n \, dx = \qquad \int \cos x \, dx =$$

$$n \neq -1$$

$$\int cf(x) \, dx = \qquad \int \sec x \tan x \, dx =$$

$$\int f(x) \pm g(x) \, dx = \qquad \int \sec^2 x \, dx =$$

$$\int e^x \, dx = \qquad \int \frac{1}{\sqrt{1-x^2}} \, dx =$$

$$\int \frac{1}{x} \, dx = \qquad \int \frac{1}{1+x^2} \, dx =$$

E. Definite Integrals

1. $\int_{-2}^2 t^2 + 3t + 3 \, dt =$

2. $\int_1^3 \frac{1}{5x} \, dx =$

3. $\int_0^1 \frac{3}{1+x^2} \, dx =$

F. Integrals

Evaluate the following integrals:

1. $\int \frac{x^4}{(2+x^5)^6} \, dx =$

2. $\int \frac{\cos(1/t)}{t^2} \, dt =$

3. $\int x\sqrt{16-3x} \, dx =$

4. $\int \frac{5+2x}{\sqrt{1-x^2}} \, dx =$

5. $\int \frac{\sin \theta}{\cos^2 \theta + 1} \, d\theta =$

6. $\int 4 \tan(2t) \, dt =$

7. $\int \frac{e^x}{1+e^x} \, dx =$

8. $\int \sec^2(5x) \, dx =$

9. $\int \frac{\sin x}{\cos^3 x} \, dx =$