

# Homework 1

## Multivariable Calculus

January 6, 2020

Write up the solution to each of the problems and turn them to me during the class on Monday January 20. If you need help, please come to my office hour on 12-1pm on Monday.

### 1 Derivatives

Find the derivative of the following functions:

1.  $f(x) = 37$

2.  $f(x) = 5x^2 + 3x - 2$

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

4.  $f(x) = x + \sqrt{x}$

5.  $f(x) = \sqrt{x}(x - 1)$

6.  $f(x) = \sqrt{1 + 2x}$

7.  $f(x) = \frac{1 - 3x}{1 + x}$

8.  $f(x) = \frac{x^2 + 4x + 3}{\sqrt{x}}$

9.  $f(x) = e^{x+1} + 1$

#### Product rule

10.  $f(x) = x^2e^x$

11.  $f(x) = \frac{e^x}{1 + x}$

12.  $f(x) = (x + e^x)(\sin x)$

## Trigonometric function

13.  $f(x) = x \sin x$

14.  $f(x) = e^x(\cos x + x)$

15.  $f(x) = \frac{\sec x}{1 + \sec x}$

16.  $f(x) = x(\sin x)(\cos x)$

## Chain rule

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

18.  $f(x) = (1 - x^2)^{10}$

19.  $f(x) = \sin(e^x)$

20.  $f(x) = e^{x \cos x}$

21.  $f(x) = x \sin\left(\frac{1}{x}\right)$

## 2 Integrals

1.  $\int (1 + 3x) dx$

2.  $\int (1 - 2x^3) dx$

3.  $\int x^{-\frac{3}{4}} dx$

4.  $\int (2 - \sqrt{x})^2 dx$

5.  $\int_{-1}^0 (2x - e^x) dx$

## U-substitution

6.  $\int (3x - 2)^{200} dx$

7.  $\int (\cos 3x) dx$

8.  $\int \frac{x}{(x^2 + 1)^2} dx$

9.  $\int \sqrt{4 - x} dx$

10.  $\int \frac{dx}{5 - 3x}$

11.  $\int \frac{dx}{x \ln x}$

12.  $\int e^{\cos x} \sin x dx$

13.  $\int \sin(\pi x) dx$

14.  $\int \frac{x}{\sqrt{x^2 + 1}} dx$

15.  $\int \frac{e^{\sqrt{x}}}{\sqrt{x}} dx$

16.  $\int \sin x \cdot \cos(\cos x) dx$

### **Integration by Parts**

17.  $\int x \sin x dx$

18.  $\int x^2 e^x dx$

19.  $\int x \ln x dx$

### **Trigonometric Integrals**

20.  $\int \sin^2 x dx$

21.  $\int \sin^3 x dx$

### **Trigonometric Substitution**

22.  $\int x\sqrt{1-x^2} dx$