

# Day One Worksheet

*SOC Methods Camp*

*September 3rd, 2019*

These are all questions from the slides. We'll work on them as they come up, and discuss as a class.

## Chain rule

1.  $f(g(x)) = \sqrt{3x^4}$

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

## Derivatives of logs and exponents

1.  $\frac{\partial}{\partial x} \ln(x^5)$

2.  $\frac{\partial}{\partial x} \ln(x^2 + 3)$

3.  $\frac{\partial}{\partial x} e^{5x+2}$

## Partial derivatives

$$f(x, y) = x^2y^5 + e^y + \ln(x)$$

Find:

1.  $\frac{\partial f(x,y)}{\partial x}$

2.  $\frac{\partial f(x,y)}{\partial y}$

3.  $\frac{\partial^2 f(x,y)}{\partial x \partial y}$

4.  $\frac{\partial^2 f(x,y)}{\partial x^2}$

## Simple case of univariate optimization

Find critical point(s) of the following function:

1.  $A(h) = 50h^{\frac{2}{3}} - 2h$

## Integrals

Solve the following using integration by parts:

1.  $\int e^x dx$

2.  $\int e^x \sin(x) dx$