

# STA505 Review Wkst

## Derivatives

Know the Power Rule, Chain Rule, and Product Rule. Know either the Quotient Rule or how to combine the previous rules to get it. Know the derivatives of logs and exponents. Know how to use derivatives to find minimums and maximums. Know how to take second derivatives. Know how to take partial derivatives. For each of the following equations make sure you can take both the first and second derivatives with respect to  $x$ .

1)  $5x^3 + \sqrt{x} + \frac{\pi}{x}$

2)  $e^{17x}$

3)  $5x^2e^{3x}$

4)  $\ln(x^2)$

5)  $\ln(e^x)$

Take the partial derivative of the following function with respect to  $x$  and  $y$ .

6)  $z = x^2 + 2xy + y^2$

## Integrals

Know the Power Rule for Integrals. Know how to take definite or indefinite integrals. Know how to implement  $u$ -substitution and integration by parts. Know the conceptual definition of an integral as the area under a curve. Know how to integrate exponential functions. Compute the following integrals:

- 1)  $\int 5e^{2x} dx$
- 2)  $\int_1^2 (5x^3 + \sqrt{x} + \frac{\pi}{3}) dx$
- 3)  $\int_{-\pi}^{\pi} x^3 dx$
- 4)  $\int_{-\pi}^{\pi} x^2 dx$
- 5)  $\int_{y=0}^1 \int_{x=1}^2 (5xy^3 + 7x^2y) dx dy$

### Geometric Series

Know the basic ideas behind the convergence and divergence of infinite series. Do the following series converge or diverge? If they converge, what do they converge to?

- 1)  $\sum_{i=1}^{\infty} (\frac{1}{4})^i$
- 2)  $\sum_{i=0}^{\infty} 5(\frac{1}{3})^i$
- 3) What is the Taylor expansion for  $e^x$ ?

### Rules of Exponents and Logs

Simplify (if possible) the following expressions using exponent/log identities.

- 1)  $\ln(ab)$
- 2)  $e^a e^b$
- 3)  $\ln(a + b)$
- 4)  $\ln(x^3)$
- 5)  $e^{\ln(x)}$