

Math 483 HW 1 2025 Due Friday, Jan. 17. Calculus review.

Calculus is very important in this class. Exam 1 does not use much calculus, but exams 3 and 4 do. Most of the final points come from topics covered after exam 2.

Place your solutions on a separate sheet of paper. DO NOT place solutions side by side.

YOU ARE BEING GRADED FOR WORK NOT JUST THE FINAL ANSWER. As a rule of thumb, you should have some idea of what you were doing, even without the book. You are encouraged to form groups to discuss ideas and HW problems, but do not copy.

1) (Q4) Find the derivative $m'(t)$ if $m(t) = \exp[\lambda(e^t - 1)]$ where $\lambda > 0$ is a **known constant**. (Note: $\exp(t) = e^t$.)

2) (Q10) Find $\int_{\theta}^{\infty} 3\theta^3 y^{-3} dy$. (Treat θ as a known positive constant.)

3) (Q10) Let $K(\theta) = n \log(\theta) + c(\theta - 1)$ where $c < 0$ and $n > 0$ are known constants. (In this course, $\log(t) = \ln(t) = \log_e(t)$, the natural logarithm of t .) To find the global maximizer θ_M of $K(\theta)$, use the following steps.

a) Find $\frac{d}{d\theta}K(\theta)$, set the resulting derivative equal to zero, and solve for θ .

b) Show that $\frac{d^2}{d\theta^2}K(\theta) < 0$.

4) (E2) Find $\int_0^3 y^2 \frac{2}{9} y dy$.

More references

Calculus: Adams, C., Hass, H., and Thompson, A. (1998), *How to Ace Calculus*, W.H. Freeman, New York, NY.

Kline, M. (1998), *Calculus: an Intuitive and Physical Approach*, 2nd ed., Dover, New York, NY.

Stewart, J. *Calculus, Early Transcendentals*

Thompson, S.P., and Gardner, M. (1998), *Calculus Made Easy*, St. Martins Press, New York, NY.

Probability and Statistics: Asimow, L.A., and Maxwell, M.M. (2010), *Probability and Statistics with Applications*, ACTEX Publications, Winsted, CT.

Bain, L.J., and Engelhardt, M. (2000), *Introduction to Probability and Mathematical Statistics*, 2nd ed., Duxbury Press, Boston. \$112

Devore, J.L., and Berk, K.N. (2007) *Modern Mathematical Statistics with Applications*, Duxbury, Belmont, CA.

Hoel, P.G. (1984), *Introduction to Mathematical Statistics*, Wiley, NY.

Montgomery, D.C. and Runger, G.C. (2007) *Applied Statistics and Probability for Engineers*, 4th ed., Wiley, Hoboken, NJ.

Ramachandran, K.M., and Tsokos, C.P. (2009) *Mathematical Statistics with Applications*, Elsevier Academic Press, Burlington, MA.

Ross, S. (2009), *Probability and Statistics for Engineers*, 4th ed., Elsevier Academic Press, Burlington, MA.

Roussas, G. (2003), *An Introduction to Probability and Statistical Inference*, Elsevier Science, San Diego, CA.

Probability:

Hoel, P.G., Port, S.C., and Stone, C.J. (1971), *Introduction to Probability Theory*, Houghton Mifflin, Boston.

Ross, S. (1984), *A First Course in Probability*, Macmillan Publishing, NY.

Lower level stat books:

David S. Moore and George P. McCabe, 1999 *Introduction to the Practice of Statistics*, 3rd ed. W.H. Freeman and Company. (100 level)

Bulmer, B.G. *Principles of Statistics*, Dover. (300 level) 519.B938p1967

Some Advanced Engineering Statistical Texts

Duda, R.O., Hart, P.E., Stork, D.G. (2000), *Pattern Classification*, 2nd ed., John Wiley and Sons, NY.

Meeker, W.Q., and Escobar, L.A. (1998), *Statistical Methods for Reliability Data*, Wiley, NY.

Poor, H.V. (1988), *An Introduction to Signal Detection and Estimation*, Springer-Verlag, NY.

Porat, B. (1993), *Digital Processing of Random Signals*, Prentice-Hall, Englewood Cliffs, NJ.

Important topics for communications and control theory (electrical engineering) include signal processing (detection or estimation), information theory, stochastic processes and pattern recognition. Important topics for computer science include data mining, information theory and pattern recognition. Important topics for manufacturing and industrial engineering include quality control and reliability.