M311 HOMEWORK ASSIGNMENTS

Please write up your answers clearly—the grader needs to be able to read your work!

All sections/page numbers refer to *Multivariable Calculus*, 8th edition, by James Stewart.

ASSIGNMENT 1. Due Friday, August 30 at the beginning of class
Section 12.1, pp 836-837: 4, 8, 10, 14, 16, 22*, 28, 35, 38, 42, 44
* Hint: Use the midpoint formula from 21a for problem 22.

ASSIGNMENT 2. Due Friday, September 6 at the beginning of class
Section 12.2, pp 845-847: 6, 16, 18, 24
Section 12.3 pp 852-854: 4, 16*, 18*, 24, 26, 40**, 56, 62
* Use a calculator for the last part.
** The “scalar projection” is just the magnitude of the projection of \( \vec{b} \) onto \( \vec{a} \).
Section 12.4, pp 861-863: 2, 7, 18, 23, 28, 30, 48

ASSIGNMENT 3. Due Friday, September 13 at the beginning of class
Section 12.4, pp 861-863: 34
Section 12.5, pp 871-873: 2, 4, 12*, 16, 24, 28, 34, 45, 48
Section 12.6, pp 879-881: 6, 12, 13, 14, 15, 16, 18
* For 12.5, problem 12, you only need to find the parametric equations, not the symmetric equations of the line.
ASSIGNMENT 4. Due Friday, September 20 at the beginning of class

Section 13.1, pp 893-895: 6, 8, 12, 18, 21-26, 32, 42, 44, 50
Section 13.2, pp 900-901: 4, 10, 20, 26, 45, 56*

Hint for 13.2: 56: Try to use property 1 in the box on page 847 and property 4 in the box on page 898.

Note: I have removed 13.2: 34 and 37 from the original assignment. They will be on next week’s assignment.

ASSIGNMENT 5. Due Friday, September 27 at the beginning of class

Problem A. Write down a definite integral that represents the arclength of the portion of the curve parametrized by

\[ r(t) = (e^{3t}, \sin t, t^2) \]

corresponding to \( t \)-values between 0 and 1. Don’t attempt to evaluate this integral.

Section 13.2, pp 900-901: 34, 37
Section 13.3 pp 908-910: 6, 11, 14, 16, 20a, 24, 30

ASSIGNMENT 6. Due Friday, October 11 at the beginning of class

Section 13.4, pp 918-919: 8, 12, 16*, 18a*
Section 14.1, pp 939-943: 10, 18, 28, 38, 48, 61-66, 68
Section 14.2, pp 950-951: 6, 10, 16, 20, 32, 34, 36, 38

* Look at example 3 on page 911 to see how to do these problems.
ASSIGNMENT 7. Due THURSDAY, October 17 at the beginning of class
Problem A. Suppose we are designing a model for a population of rabbits \( R(t) \), foxes \( F(t) \) and wolves \( W(t) \).
Assume: (i) lots of rabbits means even more rabbits since they reproduce so rapidly (ii) foxes eat rabbits but are eaten by wolves (iii) wolves eat rabbits and foxes. Our system of differential equations looks like this:
\[
\begin{align*}
\frac{dR}{dt} &= G(R, F, W) \\
\frac{dF}{dt} &= H(R, F, W) \\
\frac{dW}{dt} &= J(R, F, W)
\end{align*}
\]
Using a sentence in each case, explain what sign the quantities \( \frac{\partial G}{\partial W} \), \( \frac{\partial H}{\partial R} \) and \( \frac{\partial J}{\partial W} \) should have.

Section 14.3, pp 963-967: 3ab, 10, 18, 26, 30*, 34, 50, 54, 77, 78b, 79
* Hint: Remember that for any function \( f \) and any limits of integration \( \alpha \) and \( \beta \) one has
\[
\int_{\alpha}^{\beta} f(t) \, dt = \int_{\alpha}^{c} f(t) \, dt + \int_{c}^{\beta} f(t) \, dt = -\int_{c}^{\alpha} f(t) \, dt + \int_{c}^{\beta} f(t) \, dt
\]
for any number \( c \) between \( \alpha \) and \( \beta \). View \( \alpha \) and \( \beta \) as variables and \( c \) as a constant and apply the Fundamental Theorem of Calculus.

ASSIGNMENT 8. Due Friday, October 25 at the beginning of class
Section 14.4, pp 974-976: 4, 12*, 18*, 21, 42, 44, 46
Section 14.5, pp 983-986: 4, 6, 10, 22, 36, 45, 53
* The “linearization” and the “linear approximation” are the same as the equation of the tangent plane.
Problem A. Use the chain rule to compute \( \frac{\partial f}{\partial x} \) and \( \frac{\partial f}{\partial y} \) where \( f : \mathbb{R}^2 \to \mathbb{R} \) is given by the formula:
\[
f(x, y) = \int_{2y}^{x^3+y^2} \sqrt{1 + te^t \sec t} \, dt.
\]
ASSIGNMENT 9. Due Friday, November 1 at the beginning of class

Section 14.6, pp 996-999: 8, 12, 15, 22, 32, 37b, 42, 50, 54, 60


* For 14.7, problems 8, 12 and 15, you don’t need to do any graphing.