Final Exam ReviewProf. NolletCalculus IIIThursday, 5/8/2025, 11:00 am - 1:30 pm

New material in chapter 15 will be heavier on the final, maybe 30-40%. Refer to earlier review sheets for more detail. I am very unlikely to ask about the starred topics on the final.

- Chapter 11 3D sketches, equation of sphere, vector operations via algebra/geometry, unit vectors, decompose into length and direction, combined force problems, dot product and angle between vectors, orthogonality, projection of \mathbf{u} onto \mathbf{v} , determinants, cross product (calculation and geometry), triple scalar product, parametric lines, plane equation and normal vector, intersections of lines and planes, distance from point to plane, sketch surfaces using traces, cylinders and rulings, quadric surfaces.
- Chapter 12 Vector-valued functions $\mathbf{r}(t)$, oriented sketches, eliminate parameter, derivatives $\mathbf{r}'(t)$ and integrals $\int \mathbf{r}(t) dt$, velocity, acceleration, speed, initial value problems, projectile motion^{*}, arc length and curvature.
- Chapter 13 Functions of 2-3 variables: domains, level sets, range, sketches, limits and continuity, partial derivatives, equality of mixed partials, chain rule, directional derivative, gradient, direction of max incr./decr., tangent planes and normal lines to surfaces, critical points, second partials test to determine relative max/min/saddle points, absolute max/min on region R^* , geometric max/min problems.
- Chapter 14 Double integrals, compute as iterated integrals, endpoints and regions, changing order of integration, change to polar coordinates, triple integrals and endpoints, conversion to cylindrical or spherical coordinates.
 - 15.1-2 Line integrals $\int_C f \, ds = \int f(r(t)) |r'(t)| dt$. Vector fields $\mathbf{F} : \mathbb{R}^3 \to \mathbb{R}^3$ or $\mathbf{F} : \mathbb{R}^2 \to \mathbb{R}^2$. Set up/calculate $\int_C \mathbf{F} \cdot dr = \int_C M dx + N dy + P dz$.
 - 15.3 Test if vector field is conservative, Curl **F**, potential functions and the fundamental theorem of line integrals.
 - 15.4 Green's theorem for integrals on closed curves.
 - 15.6 For surface S given by r(u, v) and region R, set up and compute integral of scalar function $\iint_S f \ d\sigma = \iint_R f(r(u, v)) |r_u \times r_v| \ dA$, set up and compute flux integral $\iint_S \mathbf{F} \cdot \mathbf{n} \ d\sigma = \iint_R \mathbf{F}(r(u, v)) \cdot (r_u \times r_v) \ dA$.