MATH 2E REVIEW FOR FINAL

The final is in the usual classroom, Wed, December 12, 1:30pm – 3:30pm, 8–9 problems, covering Chapter 15 and 16 of Stewart calculus, no notes.

Chapter 15.

(1) Calculate $\iint_R ye^{xy}dA$, where $R = \{(x, y) \mid 0 \le x \le 2, 0 \le y \le 3\}$.

(2) Calculate $\int_0^1 \int_{\sqrt{y}}^1 \frac{ye^{x^2}}{x^3} dxdy$.

(3) Calculate $\iiint_E zdV$, where E is bounded by the planes $y = 0$, $z = 0$, $x + y = 2$ and the cylinder $y^2 + z^2 = 1$ in the first octant.

(4) Calculate $\iiint_E yzdV$ where E lies above the plane $z = 0$, below the plane $z = y$, and inside the cylinder $x^2 + y^2 = 4$.

(5) Calculate $\iiint_H z^3\sqrt{x^2 + y^2 + z^2}dV$, where H is the solid hemisphere that lies above the xy-plane and has center the origin and radius 1.

(6) Evaluate $\iint_R \frac{x - y}{x + y} dA$ where R is the square with vertices $(0, 2)$, $(1, 1)$, $(2, 2)$ and $(1, 3)$.

(7) Find the volume of the region bounded by the surface $\sqrt{x}+\sqrt{y}+\sqrt{z} = 1$ and the coordinate planes. Consider the transformation $x = u^2$, $y = v^2$, and $z = w^2$.

(8) Evaluate $\iint_R xydA$, where R is the square with vertices $(0, 0)$, $(1, 1)$, $(2, 0)$, and $(1, -1)$.

(9) Given a curve $r(t) = \langle 1 + t, t^2, t^3\rangle$, find the area of the triangle with vertices $r(-1)$, $r(1)$ and $r(0)$.

Chapter 16.

(1) Evaluate $\int_C xds$, where C is the arc of the parabola $y = x^2$ from $(0, 0)$ to $(1, 1)$.

(2) Evaluate $\int_C ydx + (x + y^2)dy$, C is the ellipse $4x^2 + 9y^2 = 36$ with counter clockwise orientation.

(3) Evaluate $\int_C F \cdot dr$, where $F = \langle\sqrt{xy}, e^y, xz\rangle$, C is given by $r(t) = \langle t^4, t^2, t^3\rangle$, $0 \le t \le 1$.

(4) Compute curl F where $F = \langle e^y, xe^y + e^z, ye^z$. Then compute the line integral $\int_C F \cdot dr$ where C is **any** curve from $(0, 2, 0)$ to $(4, 0, 3)$. Hint: fundamental theorem of line integrals.

(5) Verify Green's theorem is true for the line integral $\int_C xy^2dx - x^2ydy$, where C consists of the parabola $y = x^2$ from $(-1, 1)$ to $(1, 1)$ and the line segment from $(1, 1)$ to $(-1, 1)$.

(6) Find the area of the part of the surface $z = x^2 + 2y$ that lies above the triangle with vertices $(0, 0)$, $(1, 0)$ and $(1, 2)$.

(7) Find an equation of the tangent plane at the point $(4, -2, 1)$ to the parametric surface S given by $r(u, v) = \langle v^2, -uv, u^2\rangle$, $0 \le u \le 3$, $-3 \le v \le 3$.

(8) Evaluate $\iint_S z dS$ and $\iint_S x dS$ where S is the part of the paraboloid $z = x^2 + y^2$ that lies under the plane $z = 4$.
(9) Evaluate $\iint_S x^2 z + y^2 z dS$, where S is the part of the plane $z = 4 + x + y$ that lies inside the cylinder $x^2 + y^2 = 4$.
(10) Evaluate $\iint_S F \cdot dS$ where $F = \langle xz, -2y, 3x \rangle$ and S is the sphere $x^2 + y^2 + z^2 = 4$ with outward orientation.
(11) Verify Stokes' theorem is true for $F = \langle x^2, y^2, z^2 \rangle$, where S is the part of the paraboloid $z = 1 - x^2 - y^2$ that lies above the xy-plane and S has upward orientation.
(12) Evaluate $\int_C F \cdot dr$ where $F = \langle xy, yz, zx \rangle$ and C is the triangle with vertices $(1, 0, 0)$, $(0, 1, 0)$ and $(0, 0, 1)$, oriented counter clockwise as viewed from above.
(13) Calculate $\iint_S F \cdot dS$ where $F = \langle x^3, y^3, z^3 \rangle$ and S is the surface of the solid bounded by the cylinder $x^2 + y^2 = 1$ and the planes $z = 0$ and $z = 2$.
(14) Compute the outward flux of $F = \left\langle \frac{x}{(x^2+y^2+z^2)^{\frac{3}{2}}}, \frac{y}{(x^2+y^2+z^2)^{\frac{3}{2}}}, \frac{z}{(x^2+y^2+z^2)^{\frac{3}{2}}} \right\rangle$ through the ellipsoid $4x^2 + 9y^2 + 6z^2 = 36$.
(15) Compute $\int_C F \cdot dr$ where $F = \left\langle \frac{2x^3+2xy^2-2y}{x^2+y^2}, \frac{2y^3+2xy+2x}{x^2+y^2} \right\rangle$ around any simple closed curve containing the origin $(0, 0)$.
(16) Find the positively oriented simple closed curve C for which the value of the line integral $\int_C (y^3 - y)dx - 2x^3 dy$ is a maximum.