

Final Exam Reference Sheet

$$\frac{\mathbf{a} \cdot \mathbf{b}}{\|\mathbf{a}\| \|\mathbf{b}\|}$$

$$\frac{\mathbf{a} \cdot \mathbf{b}}{\|\mathbf{a}\|}, \quad \frac{\mathbf{a} \cdot \mathbf{b}}{\|\mathbf{a}\|^2} \mathbf{a}$$

$$\frac{\mathbf{r}'(t)}{\|\mathbf{r}'(t)\|}$$

$$\int_a^b \|\mathbf{r}'(t)\| dt, \quad \int_a^t \|\mathbf{r}'(u)\| du$$

$$\langle a, b, c \rangle \times \langle d, e, f \rangle = \begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ a & b & c \\ d & e & f \end{vmatrix} = (bf - ce)\mathbf{i} + (cd - af)\mathbf{j} + (ae - bd)\mathbf{k}$$

$$\left\| \frac{d\mathbf{T}}{ds} \right\|, \quad \frac{\|\mathbf{T}'(t)\|}{\|\mathbf{r}'(t)\|}, \quad \frac{\|\mathbf{r}'(t) \times \mathbf{r}''(t)\|}{\|\mathbf{r}'(t)\|^3}$$

$$\iint_R f(x, y) dA = \iint_S f(x(u, v), y(u, v)) \left| \frac{\partial(x, y)}{\partial(u, v)} \right| du dv$$

$$\frac{\partial(x, y)}{\partial(u, v)} = \begin{vmatrix} \frac{\partial x}{\partial u} & \frac{\partial x}{\partial v} \\ \frac{\partial y}{\partial u} & \frac{\partial y}{\partial v} \end{vmatrix}$$

$$\text{grad} f = \nabla f, \quad \text{curl} f = \nabla \times f, \quad \text{div} f = \nabla \cdot f$$

$$\int_C P dx + Q dy = \iint_D \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y} \right) dA$$

$$\int_C \mathbf{F} \cdot d\mathbf{r} = \iint_S \text{curl} \mathbf{F} \cdot d\mathbf{S}$$

$$\iint_S \mathbf{F} \cdot d\mathbf{S} = \iiint_E \text{div} \mathbf{F} dV$$