EXAM 1 IS THURSDAY IN QUIZ SECTION

Allowed:

1. A **Ti-30x IIS Calculator**
2. An 8.5 by 11 inch sheet of handwritten notes (front/back)
3. A pencil or black/blue pen

Details and rules:

1. 4 pages of questions, 50 minutes, use your time effectively.
2. **Show your work using methods from class.** The correct answer with no supporting work is worth zero points. **Must show full methods.**

Quick Review

(13.4) **Acceleration**

$$a_T = \frac{\vec{\boldsymbol{r}}' \cdot \vec{\boldsymbol{r}}''}{|\vec{\boldsymbol{r}}'|}, a_N = \frac{|\vec{\boldsymbol{r}}' \times \vec{\boldsymbol{r}}''|}{|\vec{\boldsymbol{r}}'|}$$

(14.1, 14.3, 14.4) **Analyzing Surfaces**

- Sketch domain, sketch level curves.

- Compute partial derivatives

- slope in x-direction, y-direction
- concavity in x-direction, y-direction

- Tangent planes/linear approx

$$z - z_0 = f_x\,(x - x_0) + f_y\,(y - y_0)$$

$$L(x, y) = z_0 + f_x\,(x - x_0) + f_y\,(y - y_0)$$

(14.7) **Critical Points, Max/Min**

- Set $f_x = 0$ and $f_y = 0$ combine and solve (and check).

- *Classify as local max/min, or saddle*

$$D = f_{xx}f_{yy} - (f_{xy})^2$$

i) $D > 0, f_{xx} > 0 \rightarrow$ local min
ii) $D > 0, f_{xx} < 0 \rightarrow$ local max
iii) $D < 0 \rightarrow$ saddle pt.

- *Absolute max/min*
  i) Critical points inside region?
  ii) Study boundaries.
  z = "one variable function" on each boundary
  iii) Absolute max/min must occur at a critical point inside region or a boundary.
  See what gives biggest *z*.

- *Applied max/min*
  What are you optimizing?
  Constraints?
  Give two variable function for what you are optimizing, find critical point(s).

(15.1-4): **Double Integrals**

$$\iint_R f(x,y)dA = \begin{matrix}\text{volume below f(x, y)} \\ \text{and above R}\end{matrix}$$

Setting up

i) Integrand? (z=???)

ii) Draw Region

- Draw given xy-bounds.
- Draw intersection of surfaces.

iii) Choose how to describe region

$$Top/Bottom: \int_a^b \int_{g_1(x)}^{g_2(x)} f(x,y)\, dy\, dx$$

$$Left/Right: \int_c^d \int_{h_1(y)}^{h_2(y)} f(x,y)\, dx\, dy$$

$$Polar: \int_\alpha^\beta \int_{r_1(\theta)}^{r_2(\theta)} f(r\cos(\theta), r\sin(\theta))\, r\, drd\theta$$

Other applications:

$$\iint_R 1dA = \text{area of R}$$

$$M_y = \iint_R x\, p(x,y)dA,$$

$$M_x = \iint_R y\, p(x,y)dA,$$

$$M = \iint_R p(x,y)dA,$$

$$\bar{x} = \frac{M_y}{M}, \quad \bar{y} = \frac{M_x}{M}$$