MATH 249

Today

1. 14.7a Local Extrema (Understand how to find candidates for local extrema and classify them as maxima, minima, or neither.)

2. WeBWorK

3. Homefun/Python

14.7 Local Extrema

1. Theorem (Test for Candidates): If f has a local extremum at (a, b) and f_x and f_y exist at (a, b), then $f_x(a, b) = 0 = f_y(a, b)$.

2. Theorem (Second Derivatives Test): Suppose that the second partials of f are continuous on a disk centered at (a, b) and that $f_x(a, b) = 0 = f_y(a, b)$. Let

$$D = D(a, b) = f_{xx}(a, b)f_{yy}(a, b) - (f_{xy}(a, b))^2.$$

   (a) If $\mathbf{D > 0}$ and $f_{xx}(a, b) > 0$, then $f(a, b)$ is a local minimum.
   (b) If $\mathbf{D > 0}$ and $f_{xx}(a, b) < 0$, then $f(a, b)$ is a local maximum.
   (c) If $\mathbf{D < 0}$ f has a saddle point at (a, b).
   (d) If $D = 0$, the test fails.

   NOTE: The sign of D only tells you **whether** f has an extremum, **NOT** which kind.

3. Examples p. 930: #7, 10, 3, 4, 39, 51

4. WeBWorK: 3,4

Next Time

1. Watch 14.7b [$\sim$ 29 minutes]