Math 112 Final Exam Review

1. Derivatives
   - derivatives as the slope of a tangent line
   - using secant lines to compute the derivative
   - derivative as instantaneous rate of change: "derivative"="rate"
     Remember other rates of change: incremental (e.g. average speed), overall (e.g. average trip speed)
   - derived graphs - what does the derived graph of f tell you about f?
   - derivative rules
   - partial derivatives
2. Optimization - using the derivative (or not)
   - finding local/global optima (max/min)
   - second derivative test
   - concavity
   - line fitting
   - best-fit exponential functions
   - linear programming
3. Integration
   - $\int_a^b f(x)\,dx$ = (area of stuff above x-axis) - (area of stuff below x-axis)
   - counting squares and using trapezoids to approximate $\int_a^b f(x)dx$
   - using FTOC to compute $\int_a^b f(x)\,dx$
   - $\int f(x)\,dx =$ the anti-derivative of $f(x)$ (remember the $+C$!)
   - areas between curves
4. The Big Examples
   (a) Distance/Speed
   - speed = derivative of distance
     - if given a graph of distance, find instantaneous speed using slope of tangent line
     - if given a formula for distance, take derivative to get instantaneous speed
   - distance = integral of speed
     - if given only a graph of speed, find distance by taking areas

- if given a formula for speed, take anti-derivatives to get distance

(b) TR/MR,TC/MC

- MR=derivative of TR
  - given the graph of TR, find MR using slope of tangent line
  - given the formula for TR, find MR by taking the derivative
- TR=integral of MR
  - given the graph of MR, find TR by taking areas
  - given the formula for MR, find TR by antidifferentiating
- TC/MC are similar, except you must consider FC:

  $$TC = (\text{integral of } MC) + FC$$

  - given graph of MC, find TC by taking areas and adding on FC
  - given formula for MC, find TC by antidifferentiating and adding on FC
- profit = (area between MR & MC when MR>MC) - (area between MR & MC when MR<MC) - FC

Example: