**Harold’s Fundamental Theorems of Calculus**

**“Cheat Sheet”**

17 October 2020

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| **Formulas** | | **Examples** |
| **1) The First Fundamental Theorem of Calculus: Integrating Derivatives** | | 1) Solve |
| **2) The Second Fundamental Theorem of Calculus: Differentiating Integrals**  Simple Formula  General Formula  How to find the area under a curve? | StudyPug | | 2) Solve  2nd FToC General Formula  Determine functions  Substitute  Differentiate  Plug them back into the formula  Simplify |
| **Second FTC** **Proof #1** | | **Second FTC Proof #2** | |
| Proof of the Second Fundamental Theorem of Calculus :  a) Break integral into two parts  b) Change bounds  c) Apply the First Fundamantal Theorem of Calculus  d) Take the derivative  e) Use the derivative chain rule  f) Using the Second Fundamantal Theorem of Calculus we see that and .  g) This completes the proof of the general formula. | | Proof of the Second Fundamental Theorem of Calculus :  a) Apply the First Fundamantal Theorem of Calculus  b) Distribute  c) Chain rule  d) Simplify  e) Substitute | |
| Formulas used in the proofs:  Equivalent Notation  Change of Bounds  Derivative Chain Rule | |