Activity 8.5‡ – The Fundamental Theorem of Calculus (Part 2)

FOR DISCUSSION: *State Part 2 of the Fundamental Theorem of Calculus in your own words. Geometrically, what does Part 2 of the FTC measure?*

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1. Find the derivative (with respect to x) of each function. Remember to rewrite the integral with the function of x in the upper limit, and remember to apply the chain rule if necessary.

   (a) $f(x) = \int_0^x \sqrt{t^5 + 5t^2}\,dt$

   (b) $y(x) = \int_x^1 \frac{t^3}{e^t + 4}dt$

   (c) $F(x) = \int_3^{2x} \arctan\left(t^2 + 10\right)dt$

   (d) $H(x) = \int_1^{e^x} \frac{1}{\sqrt[3]{t^2 + 2t}}\,dt$

   (e) $g(x) = \int_{5x^2}^1 \cos(\ln(t))dt$

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‡ This activity has supplemental exercises.

2. Let $G(x) = \int_1^{3x} e^{-t^2}\,dt$. Evaluate each of the following.

(a) $G\left(\frac{1}{3}\right)$ =

(b) $G'(x)$ =

(c) $G'(0)$ =

3. Let $F(x) = \int_0^{x^2} (t-1)e^t\,dt$.

(a) Compute $F'(x)$, and then determine the critical points of *F*.

(b) Compute $F''(x)$, and then determine the inflection points of *F*.