1. Compute the following integrals:

(a) \( \int_{2}^{5} (5x^4 + 3x^2) \) 

(b) \( \int_{0}^{\pi} (2 \sin x - \cos x) \)

2. Compute the following derivatives:

(a) \( D \left( \frac{x^2}{\sqrt{\sin x}} \right) \)
3. What theorem is needed to prove that if $Df = 0$, then $f$ must be a constant?

4. Let $f, g : A \to \mathbb{R}$ be two differentiable functions. Show that if $Df = Dg$, then $f - g$ is a constant.

5. (a) State the Extreme-Value Theorem. Be sure to state the assumptions about the function and its domain carefully.

(b) Give an example of a function that does not have a maximum. Be sure to specify the domain of your function explicitly.

6. Match the following statements to their sources.

   “Mathematicians are machines for turning coffee into theorems.”
   “By ‘life,’ I mean ‘math.’”
   “The Brouwer Fixed-Point Theorem is false.”

   L. E. J. Brouwer
   Pál Erdős
   Pramod N. Achar