(1) (20 pts) Find the maximum and minimum values of the function $f(x) = -x^{2/3}$ on the closed interval $[-8, 8]$.

(2) (16 pts) Let $f(x)$ be a continuous function. Label each of the following statements as true or false; if a statement is false, give an example showing that it's false.

(a) If x_0 is not a critical point of $f(x)$, then x_0 is not a local maximum for $f(x)$.

(b) If x_0 is not a local maximum of $f(x)$, then x_0 is not a critical point for $f(x)$.

(c) If $\int_{-4}^{-3} f(x)\,dx$ equals 0, then $f(x) \equiv 0$ (i.e., $f(x)$ is the constant function 0).

(d) If y lies on the curve $x^2 + 5y^2 = 1$, then dy/dx is defined at every point on the curve.

(3) (25 pts) Reliable Red Barclay is a truck driver. Suppose that it costs Red $\left(1 + (\frac{2}{30{,}000})v^{3/2}\right)$ dollars per kilometer to operate his truck at v kilometers per hour. If there are additional costs (for things like caffeine pills) of \$10 per hour, how fast should he drive to minimize the total cost of a 1000 kilometer trip? (You should ignore speed limits - Red does.)

(4) (12 pts) Compute the following limits, or show that they don't exist.

(a) $\lim_{x \to 0} \frac{\ln x}{x^2}$

(b) $\lim_{x \to \infty} \frac{\ln x}{x^2}$

(5) (12 pts) Sketch the graph of a continuous function f (you don't need to give a formula for f) on the interval $[2, 5]$ with the property that with $n = 3$ subdivisions,

$$\int_2^5 f(x)\, dx < \text{Right-hand sum} < \text{Left-hand sum}.$$

(6) (15 pts) Use linear approximation to estimate $\ln(0.9)$.