Derivatives

1. Let $f(x) = \sqrt{x}$.

(a) Find the best linear approximation to $f(x)$ at $x = 100$

(b) Estimate the value of $\sqrt{104}$.

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2. Let $g(x) = (8 + x)^{-1/3}$

(a) Find the best linear approximation to $g(x)$ at $x = 0$

(b) Estimate the value of $g(-0.1)$.

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3. Luke Skywalker, a young farmer on the planet Tatooine, wants to build a pen for his banthas. He has 100 yards of fence and wants to create a rectangular pen with the largest possible area. What is the largest possible area? What are the dimensions of the pen?

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4. What is the largest possible surface area of a cylinder inscribed in a sphere of radius R? What is the largest possible volume?