

1998 Calculus BC Free-Response Questions

2. Let f be the function given by $f(x) = 2xe^{2x}$.
- (a) Find $\lim_{x \rightarrow -\infty} f(x)$ and $\lim_{x \rightarrow \infty} f(x)$.
 - (b) Find the absolute minimum value of f . Justify that your answer is an absolute minimum.
 - (c) What is the range of f ?
 - (d) Consider the family of functions defined by $y = bxe^{bx}$, where b is a nonzero constant. Show that the absolute minimum value of bxe^{bx} is the same for all nonzero values of b .
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3. Let f be a function that has derivatives of all orders for all real numbers. Assume $f(0) = 5$, $f'(0) = -3$, $f''(0) = 1$, and $f'''(0) = 4$.
- (a) Write the third-degree Taylor polynomial for f about $x = 0$ and use it to approximate $f(0.2)$.
 - (b) Write the fourth-degree Taylor polynomial for g , where $g(x) = f(x^2)$, about $x = 0$.
 - (c) Write the third-degree Taylor polynomial for h , where $h(x) = \int_0^x f(t) dt$, about $x = 0$.
 - (d) Let h be defined as in part (c). Given that $f(1) = 3$, either find the exact value of $h(1)$ or explain why it cannot be determined.
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