AP Calculus AB
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Homework 0413
Monday, April 13, 2020

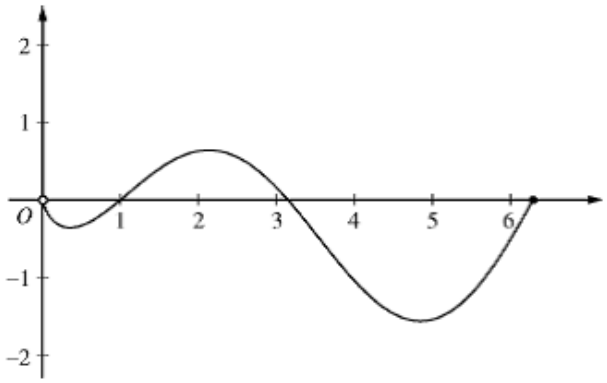
Problem 1. Let f be the function given by $f(x) = \ln\left(\dfrac{x}{x-1}\right)$.

(a) What is the domain of f?

(b) Find the value of the derivative of f at $x = -1$.

(c) Write an expression for $f^{-1}(x)$, where f^{-1} denotes the inverse function of f.

Problem 2. Let f be the function given by $f(x) = (\ln x)(\sin x)$, shown for $0 < x \leq 2\pi$.



Graph of f

The function g is defined by $g(x) = \int_1^x f(t)\,dt$ for $0 < x < 2\pi$.

(a) Find $g(1)$ and $g'(1)$.

(b) On what intervals, if any, is g increasing? Justify your answer.

(c) For $0 < x \leq 2\pi$, find the value of x at which g has an absolute minimum. Justify your answer.

(d) For $0 < x \leq 2\pi$, is there a value of x at which the graph of g is tangent to the x-axis? Explain why or why not.