AP CALCULUS AB
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Homework 4.8
Friday, January 17, 2020

Name:

Write your homework *neatly*, *in pencil*, on blank white $8\frac{1}{2} \times 11$ printer paper. Always *write the problem*, or at least enough of it so that your work is readable. If the problem involves a function, write the function. If the problem involves an equation, write the equation. Use words, and when appropriate, *write in sentences.*

Definition 1. Let f be defined on an interval I.

A function F is an *antiderivative* of f on I if $F'(x) = f(x)$ for all $x \in I$.

The *indefinite integral* of f is the set of all antiderivatives of f, and is denoted

$$\int f(x)\,dx.$$

The symbol $\int$ is called an *integral sign*. We call f the *integrand*, and x is the *variable of integration*.

If F is one antiderivative for f, any other antiderivative differs from F by a constant. Thus

$$\int f(x)\,dx = F(x) + C,$$

where the C on the right hand side is interpreted as the set of all functions obtained by adding all constant values of C to $F(x)$.

Problem 1. Write an antiderivative for each of the following functions.

(a) x^n

(b) $\cos x$

(c) $\sin x$

(d) $\sec^2 x$

(e) $\sec x \tan x$

(f) $\dfrac{1}{x}$

(g) $\exp x$

(h) $3x^2 + \dfrac{2}{x} + \tan^2 x + 1$

Problem 2. Let

$$f(x) = 6x^3 - 11x^2 - 24x + 9.$$

Note that $f(3) = 0$. Find all zeros of f.

Problem 3. Let

$$f(x) = x^4 + 4x^3 - 48x^2 + 5x + 17.$$

(a) Find the slope-intercept form of the equation of the line tangent to the graph of f at the point $(0, 17)$.

(b) Find all points of inflection of f.

(c) Find a maximal interval on which f is concave down.

Problem 4. Thomas Problem §4.5 # 12.

Problem 5. Thomas Problem §4.5 # 24.

Problem 6. Consider the family of functions $f(x) = x^4 - ax^2$. Show that f has a local maximum if and only if f has 3 distinct zeros.