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## Exam IV Calculus I; Fall 2011

## Part I

Part I consists of 10 questions, each worth 6 points. Clearly show your work for each of the problems listed.

(1) Let  $f(x) = 3x^4 + 4x^3 - 12x^2$ . Find all local/absolute max/min of f(x). State both x and y coordinates.

(2) Find the absolute max/min of  $f(x) = x^5 - 1$  on the interval [-1, 1]. Give both x and y-coordinates and justify your answer.

(3) Find two positive numbers whose sum is 10 and whose product is maximal. (You must justify your answer!)

(4) Find the number c whose existence is guaranteed by the Mean Value Theorem for the function  $y = f(x) = x^2$  on the interval [-1, 2].

(5) If  $f'(x) = (x-3)^4(x+5)^5$ . Note that you are already given the derivative f'(x). Find all critical points, where f(x) is increasing and decreasing, and also find the x-coordinate(s) of all local max/min.

(6) Find the most general **anti-**derivative of  $f(x) = \frac{x^2 \sin(x) + x^3}{x^2}$ .

(7) Find the most general **anti-**derivative of  $f(x) = \sqrt{x}(x+1)$ .

(8) Find all asymptotes of the function  $\frac{1-x^2}{(x+2)(x-3)}$ .

(9) If the acceleration is given by  $a(t) = t^2$ , v(0) = 1 and s(0) = 2, find S(2).

(10) Find the most general anti- derivative of  $y=f(x)=\frac{1}{\sqrt{1-x^2}}+\frac{1}{x}$ 

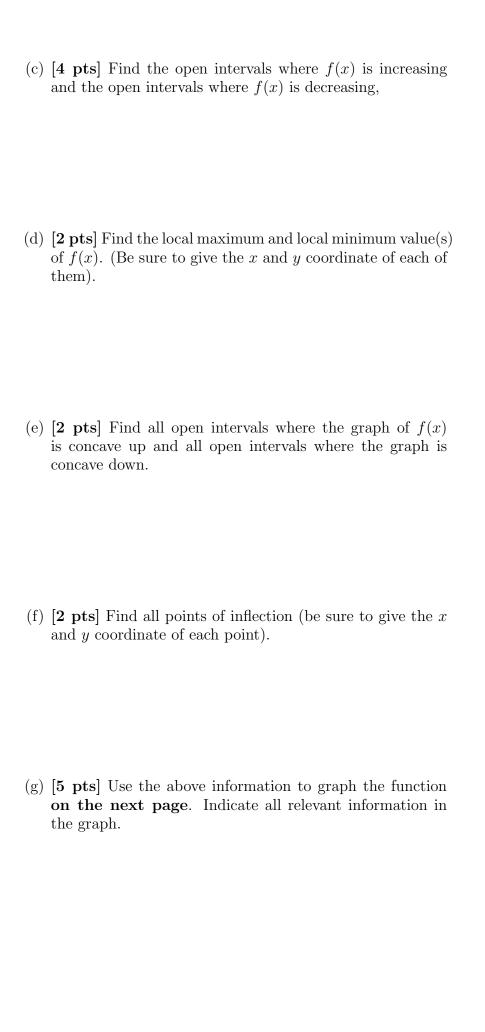
## Part II

Part II consists of 3 problems; the number of points for each part are indicated by [x pts]. You must show the relevant steps (as we did in class) and justify your answer to earn credit. Simplify your answer when possible.

(1) [10 pts] Find the absolute max/min of the function f(x) = $(x^2-2x)^3$  on the interval [-2,2].

- (2) Given the function  $f(x) = \frac{(x^2-4)}{(x+1)^2}$  (a) [2 pts] Find the x and y intercepts of the function.

(b) [3 pts] Find all asymptotes.



Put the graph of Problem 2 on this page.

(3) [10 pts] An oil rig is located 2 km off shore at point A. The closest point B on the shore is 15 km from an oil refinery (which is also located on the shore). If it costs \$100/km to lay a pipe line in the ocean and \$5/km to lay a pipe line on land, determine the cheapest way to lay a pipe line from the oil rig to the refinery.