AP Calculus BC Name: ________________________________

Unit 4 Review

These problems provide an overview, but we recommend that you also review all homework problems from the unit.

#1) Given the cost function $C(x) = 680 + 4x + 0.01x^2$ and the function that determines the number of units produced as a function of the selling price p, $x(p) = 6000 - 500p$, find the production level that will maximize profit.

#2) Find the local and absolute extrema values of the function on the given interval:

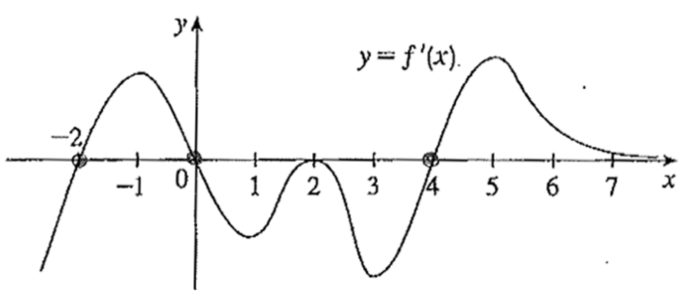
$f(x) = x^2 e^{-x}, \quad [0,3]$

#3) Evaluate the limit: $\lim_{x\to\infty} \frac{\ln(\ln x)}{\ln x}$

#4) The figure shows the graph of the derivative f' of a function f.

(a) On what intervals is f increasing or decreasing?

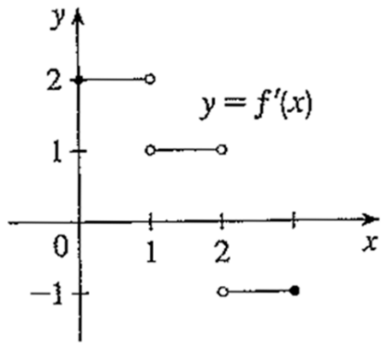
(b) For what values of x does f have a local maximum or minimum?



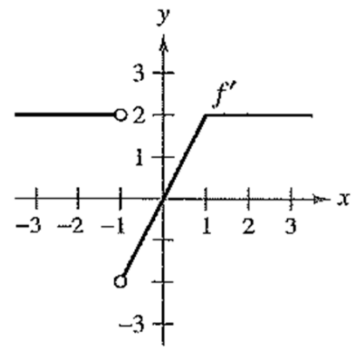
#5) Verify that the function satisfies the hypotheses of the Mean Value Theorem on the given interval. Then find all numbers c that satisfy the conclusion of the Mean Value Theorem.

$f(x) = \frac{x}{x+2}, \quad [1,4]$

#6) The graph of $f\,'$ is shown in the figure. Sketch the graph of f if f is continuous and $f(0)=-1$.



#7) Given the graph of the derivative of f sketch a possible curve for f



#8) (multiple choice) The graph of $y=x^4+8x^3-72x^2+4$ is concave down for which interval:
(A) $-6<x<2$ (B) $x>2$ (C) $x<-6$ (D) $-3-3\sqrt{5}<x<-3+3\sqrt{5}$ (E) $x<-3-3\sqrt{5}$ *or* $x>-3+3\sqrt{5}$

#9) Evaluate the limit: $\lim_{x\to 1} x^{\frac{1}{1-x}}$

#10) Evaluate the limit: $\lim_{x\to 0}\dfrac{\ln(1-x)+x+\frac{1}{2}x^2}{x^3}$

#11) (multiple choice) If $f(x)=\dfrac{x^2+5x-24}{x^2+10x+16}$, then $\lim_{x\to -8} f(x)=$

(A) 0 (B) 1 (C) $-\frac{3}{2}$ (D) $\frac{11}{6}$ (E) *Nonexistent*

#12) A rectangular solid (with a square base) has a surface area of 337.5 cm^2. Find the dimensions that will result in a solid with maximum volume.

#13) A city recreation department plans to build a rectangular playground having an area of 3600 m^2 and surround it by a fence. How can this be done using the least amount of fencing?

#14) A rectangular solid (with a square base) must have a volume of 200 m^3. Find the dimensions that will result in a minimum fabrication cost if the material on the top and bottom costs \$10/m^2 and the material on the sides costs \$6/m^2.