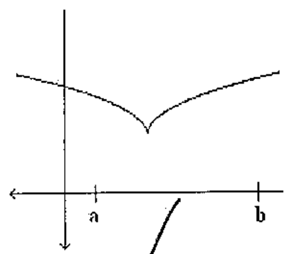
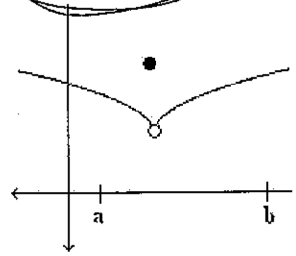
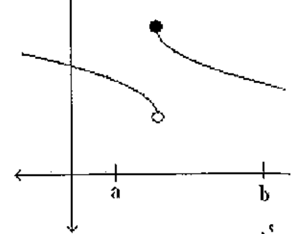
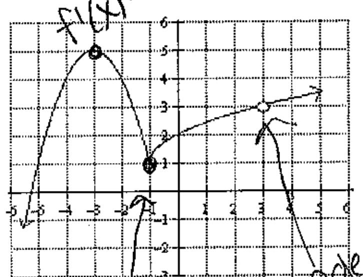
AP Calculus AB Name: Answer Key*

Unit 5 – Day 1 – Assignment

1. For which of the following functions is the Extreme Value Theorem NOT APPLICABLE on the interval $[a, b]$? Give a reason for your answer.

Graph I	Graph II	Graph III
		
✓	Not continuous on $[a,b]$	NOT continuous on $[a,b]$

For exercises 2 – 4, determine the critical numbers for each of the functions below.

2. $f'(x)=0$  undefined undef. $\boxed{x=-3,\ x=-1,\ x=3}$	3. $g(x)=\ln(x^2+4)$ $g'(x)=\dfrac{2x}{x^2+4}$ $2x=0$ $\boxed{x=0}$ $x^2+4=0$ $\cancel{x^2=-4}$	4. $h(x)=\sqrt[3]{x+3}$ $(x+3)^{1/3}$ $h'(x)=\frac{1}{3}(x+3)^{-2/3}(1)$ $\dfrac{1}{3\sqrt[3]{(x+3)^2}}$ $x+3=0$ $\boxed{x=-3}$

5. Given the function below, apply the Extreme Value Theorem to find the absolute extrema of $f(x)$ on the indicated interval.

$f(x)=\sin x\cdot\ln(x+1)$ on the interval $[1, 6]$

$f'(x)=(\cos x)(\ln(x+1))+(\sin x)\left(\frac{1}{x+1}\right)$

$f'(x)=0$ when $x=1.887$ $x=4.810$

$f(1)=0.583$

$f(6)=-0.544$

$f(1.887)=1.008$

$f(4.810)=-1.751$

*abs. min → $(4.810, -1.751)$

*abs. max → $(1.887, 1.008)$

* NO CALCULATOR!

For exercises 6 – 9, determine the absolute extreme values on the given interval. You should do each of these independent from a calculator.

6. $f(x)=x^3-3x^2$ on the interval $[-1, 3]$ $f'(x)=3x^2-6x$ $3x^2-6x=0$ $3x(x-2)=0$ $x=0$ $x=2$ when $f'(x)=0$ $f(-1)=(-1)^3-3(-1)^2=-1-3=-4$ $f(3)=(3)^3-3(3)^2=27-27=0$ $f(0)=(0)^3-3(0)^2=0$ $f(2)=(2)^3-3(2)^2=8-12=-4$ *abs min → $(-1,-4)$ & $(2,-4)$ *abs max → $(3,0)$ & $(0,0)$	7. $g(x)=\sqrt[3]{x+2}$ on the interval $[-3, 6]$ $g(x)=(x+2)^{1/3}$ $g'(x)=\frac{1}{3}(x+2)^{-2/3}=\frac{1}{3\sqrt[3]{(x+2)^2}}$ $g'(x)$ is undef. when $x=-2$ $g(-3)=\sqrt[3]{-3+2}=-1$ $g(6)=\sqrt[3]{6+2}=\sqrt[3]{8}=2$ $g(-2)=\sqrt[3]{-2+2}=0$ *abs min → $(-3,-1)$ *abs max → $(6,2)$
8. $h(x)=\frac{x}{x+2}$ on the interval $[-4, 0]$ Since $h(x)$ is undefined at $x=-2$, then $h(x)$ is not continuous on $[-4,0]$, so the E.V.T. is not applicable.	9. $f(x)=3x^{\frac{2}{3}}-2x$ on the interval $[-1, 1]$ $f'(x)=2x^{-1/3}-2$ $\frac{2}{\sqrt[3]{x}}-2=0$ $\frac{2}{\sqrt[3]{x}}=2$ $2=2\sqrt[3]{x}$ $1=\sqrt[3]{x}$ $x=1$ when $f'(x)=0$ $f'(x)$ is undef. at $x=0$ $\sqrt[3]{(-1)^2}$ $f(-1)=3(-1)^{2/3}-2(-1)=3+2=5$ $f(1)=3(1)^{2/3}-2(1)=3-2=1$ $f(0)=3(0)^{2/3}-2(0)=0$

* abs min → $(0,0)$

* abs max → $(-1,5)$