AP CALCULUS BC	**YouTube Live Virtual Lessons**	**Mr. Bryan Passwater** **Mr. Anthony Record**
Topic: All Units	**Free Response Question Stem Types** **Algebraic**	**Date:** April 29, 2020

Free Response Questions Stem Types: Algebraic
2020 FRQ Practice Problem BC1

BC1: Let g be the function defined by $g(x) = \dfrac{f(x)}{(2x)(2x-1)}$.

(**a**) If the slope of the line tangent to the graph of g at $x = \dfrac{1}{4}$ is -12, find the slope of the line tangent to the graph of f at $x = \dfrac{1}{4}$.

(**b**) When $f(x) = 1$, g can be written as $g(x) = \dfrac{1}{2x-1} - \dfrac{1}{2x}$. For $f(x) = 1$, determine if $\sum_{n=1}^{\infty} a_n$ converges or diverges where $a_n = g(n)$.

(**c**) If the function g has a critical point at $x = 1$, find the x intercept the line tangent to $f(x)$ at $x = 1$.

The problem has been restated.

BC1: Let g be the function defined by $g(x) = \dfrac{f(x)}{(2x)(2x-1)}$.

(**d**) Consider the series $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$ where $a_n = f(n)$ and $b_n = g(n)$. If $\lim_{n\to\infty}\left|\dfrac{b_{n+1}}{b_n}\right| = \dfrac{11}{7}$ use the ratio test to determine if the series $\sum_{n=1}^{\infty}\left(\dfrac{2}{3}\right)^n a_n$ converges or diverges.

(**e**) If $\int g(x)dx = \dfrac{1}{2}ln|(2x)(2x-1)| + C$, find an expression for $f(x)$.

Free Response Questions Stem Types: Algebraic
2020 FRQ Practice Problem BC2

BC2: Let f be the piecewise defined function defined by $f(x) = \begin{cases} ax + b, & x < 0 \\ 4e^{-2x}, & x \geq 0 \end{cases}$ where a and b are constants.

(**a**) Find the values for a and b such that $f(x)$ is differentiable at $x = 0$.

(**b**) Let p be a function such that $f(x) = x^2 - \int_0^x p(t)dt$. Find any nonzero value(s) of x where p has a critical point.

(**c**) Let $k(x) = f\big(f(x)\big)$ where $a = b = 2$. Find $k'\left(-\frac{1}{2}\right)$.

The problem has been restated.

BC2: Let f be the piecewise defined function defined by $f(x) = \begin{cases} ax+b, & x<0 \\ 4e^{-2x}, & x \geq 0 \end{cases}$ where a and b are constants.

(**d**) If $\lim_{x \to -1} \dfrac{f(x)}{1-x^2} = 3$, find the values of a and b.

(**e**) Let $h(x) = e^{f(x)}$. The 2nd degree Taylor polynomial for $h(x)$ centered at $x = -3$ is given by $P_2(x) = 1 - 2(x+3) + 2(x+3)^2$. Find a and b.

Free Response Questions Stem Types: Algebraic
2020 FRQ Practice Problem BC3

BC3: Let g be the function defined by $g(x) = \dfrac{f(x)}{(2x)(2x-1)}$.

(a) Let $h(x) = \begin{cases} g(x), & x < \dfrac{1}{2} \\ 3e^{2x-1}, & x \geq \dfrac{1}{2} \end{cases}$. If h is continuous at $x = \dfrac{1}{2}$, write an equation of the line tangent to $f(x)$ at $x = \dfrac{1}{2}$.

(b) If $\lim\limits_{x \to 0} g(x) = -5$ and $f(x) = a\sin(\pi x) + b$, find a and b.

(c) Find $\displaystyle\int_1^4 g(x)dx$ when $f(x) = 4x + 3$.

Free Response Questions Stem Types: Algebraic
2020 FRQ Practice Problem BC4

BC4: Let f be the piecewise defined function defined by $f(x) = \begin{cases} ax+b, & x<0 \\ 4e^{-2x}, & x \geq 0 \end{cases}$ where a and b are constants.

(**a**) Let $g(x) = \dfrac{f(x)}{2x}$. Find $g'(1)$.

(**b**) Let $a = 2$ and $b = 0$, find the average value of $f(x)$ over the interval $[-1, 1]$.

(**c**) Let $a = b > 0$, find the values of a and b such that $\displaystyle\int_{-1}^{0} f(x)dx = \int_{0}^{\infty} f(x)dx$.

(**d**) Let $a_n = f(n)$. Find $\displaystyle\sum_{n=0}^{\infty} a_n$.