Rock Ridge High School

43460 Loudoun Reserve Drive
Ashburn, VA 20148
P: 571-367-4100 F: 571-252-1636

June 4, 2020

Dear BC Calculus Student,

Congratulations on your wisdom in taking the BC course! I know you will find it rewarding and a great way to spend next year. This course is primarily concerned with developing your understanding of the concepts of calculus and providing experience with its methods and applications. The course emphasizes a multi-representational approach to calculus, with concepts, results, and problems being expressed graphically, numerically, analytically, and verbally. In order to be successful in this course you need the proper foundation (i.e. knowledge of algebra, geometry, trigonometry, analytic geometry, and elementary functions). You will have to be very familiar with the basic families of functions, and all of their representations, in order to be successful in your study of calculus. The concept of functions underlies everything that calculus considers.

You will also need to be able to carry out certain computational tasks (i.e. algebra skills) with efficiency and accuracy if you are going to be successful in calculus. These include manipulations of functional symbolism, solving algebraic equations involving the functions mentioned above, interpreting numerical values given by formulas, graphs, and tables, using and manipulating data, and knowing how, and when to use your calculator.

This is a rigorous college course. The curriculum and pace of the course is intense and all enrolled students are encouraged to take the AP exam. Since this is a *college class,* you can expect to spend approximately 1-2 hours completing homework or studying for every hour that you are in class learning. Each test and quiz that is given is *cumulative* and will be graded as per the College Board guidelines. Therefore, this course will be challenging and demanding. If you do not own your own graphing calculator, I strongly encourage you to purchase one this summer. Spend some time this summer familiarizing yourself with the capabilities of your calculator. The school does have a class set of TI-83's and TI-89's that will be available in class.

While this packet will be a formative assessment, please be advised that a summative assessment will be given during the first quarter on this material. This assessment will cover the following concepts and skills: algebra, geometry, trigonometry, functions, and the basic understanding of limits (i.e., your pre-calculus skills). Moreover, y**ou will be *tested* on this material throughout the entire year,** so it is in your best interest to review the sample questions provided on the subsequent pages, and prepare yourself prior to the first day of school. Again, while you are not required to complete any of these problems (this will not be graded), be advised that these are the skills that I expect you to possess prior to the first day of school. Therefore, if you are unable to answer some of these questions, I suggest that you start studying! Extra practice problems including limits, derivatives, and applications of derivatives are available in my Vision course.

Feel free to contact me with any questions or concerns that you or your parents may have. I have review resources available on my Vision page. My e-mail is included below. Have a restful summer and be ready to talk math again in August.

Sincerely,

Lyubov. Presnetsova

Mrs. Lyubov Presnetsova
Lyubov.Presnetsova@lcps.org

BC Calculus Skills/Content Review Name:

This is a formative assignment; it will not count as a grade. This packet is intended to reinforce prior knowledge, these are the expected skills and content for the class. You may work together on this packet and remember to show work and/or explanations, as needed. ___ _____

No calculator may be used on this section.

_____1. The zeros of the polynomial function $f(x) = x^4 - 3x^3$ are

a) 0 and 3 b) 0 only c) 3 only d) 3 and 4 e) 4 only

_____2. $\tan^{-1}\left(\sqrt{3}\right)$ is equal to

a) 1 b) $\frac{\pi}{4}$ c) $\frac{\pi}{6}$ d) $\frac{\pi}{3}$ e) $\frac{\pi}{2}$

_____3. Solve for x: $e^{2x} = 9$

a) $\ln 9$ b) $\ln 4.5$ c) $\ln 3$ d) ± 4.5 e) no solution

_____ 4. The graph of $f(x) = \frac{x^2 - 1}{x - 1}$ has

a) A hole at $x = 1$ b) A hole at $x = -1$ c) $f(1) = 2$

d)A vertical asymptote at $x = 1$ e) A vertical asymptote at $x = -1$

_____5. Find the equation of the horizontal asymptote of $f(x)=\frac{2x-1}{4x+1}$

a) $y=2$ b) $x=2$ c) $y=\frac{1}{2}$ d) $x=\frac{1}{2}$ e) $y=-1$

_____6. Find the equation of the vertical asymptote(s) of $f(x)=\frac{2x}{x^2-4}$

a) $y=0$ b) $x=0$ c) $x=2$ d) $x=\pm 2$ e) $y=2$

_____7. Find the value of $\lim_{x\to\infty}\frac{2x}{x+2}$.

a) 0 b) $\frac{1}{2}$ c) 1 d) 2 e) ∞

_____8. Find the value of $\lim_{x\to 2^-}\frac{2x}{x-2}$.

a) $-\infty$ b) $\frac{1}{2}$ c) 1 d) 2 e) ∞

_____9. Evaluate $\lim_{x\to -1}\frac{x^2-5x-6}{x^2-1}$

a) 1 b) 3 c) $\frac{7}{2}$ d) 12 e) DNE

_____10. Evaluate $\lim_{x\to 0}\frac{x-1}{x^2-1}$

a) $-\frac{1}{2}$ b) $\frac{1}{4}$ c) $\frac{1}{2}$ d) 1 e)DNE

_____11. Evaluate $\lim_{x\to 9}\frac{\sqrt{x}-3}{x-9}$

a) 1 b) $\frac{1}{3}$ c) $\frac{1}{6}$ d) $-\frac{1}{3}$ e) DNE

_____12. Evaluate $\lim_{x\to 0}\frac{\sin 7x}{x}$

a) 0 b) $\frac{1}{7}$ c) 1 d) 7 e) DNE

In exercises 13-15 use $f(x)=\begin{cases}x+3, x<0\\ x-3, x\geq 0\end{cases}$

_____13. $\lim_{x\to 0^-} f(x) =$

a) -3 b) 0 c) 1 d) 3 e) DNE

_____14. $\lim_{x\to 0^+} f(x) =$

a) -3 b) 0 c) 1 d) 3 e) DNE

_____15. $\lim_{x\to 0} f(x) =$

a) -3 b) 0 c) 1 d) 3 e) DNE

_____ 16. The average rate of change of $f(x)=4x-x^2$ on the interval $[1,3]$ is

a) 2 b) 1 c) 0 d) -1 e) -2

_____17. If $y=\sqrt{x^2-2x}$, then $y'=$

a) $\frac{1}{2}(x^2-2x)$ b) $\frac{1}{2}(x^2-2x)^{-\frac{1}{2}}$ c) $(x^2-2x)^{-\frac{1}{2}}(x-1)$

d) $x-1$ e) $(x^2-2x)(x-1)$

_____18. Find the derivative of $f(x)=\sin(x^2)$

a) $\cos(x^2)$ b) $2\sin x\cos x$ c) $2x\sin(x^2)$

d) $2x\sin x$ e) $2x\cos(x^2)$

_____19. Find the derivative of $f(x)=\cos^2 x$.

a) $\sin^2 x$ b) $1-\sin^2 x$ c) $2\cos x$

d) $-\sin 2x$ e) $-2\sin(2x)$

_____20. Given $f(x)=x\cos x$, find the second derivative of $f(x)$

a) $-x\sin x$ b) $-\cos x$ c) $-x\cos x\sin^2 x$

d) $-x\cos x-2\sin x$ e) $x\sin x$

_____21. Find the slope of the line tangent to $f(x)=\frac{1}{x^2+1}$ at $x=-1$

a) -2 b) $\frac{1}{2}$ c) 1 d) 2 e) undefined

_____22. Write the equation of the line tangent to the graph of $f(x)=\frac{1}{x^2+2}$ at $x=0$.

a) $y=\frac{1}{2}$ b) $x=\frac{1}{2}$ c) $y=-\frac{16}{81}x+\frac{1}{2}$

d) $y=-\frac{1}{2}$ e) $y=-\frac{1}{4}x+\frac{1}{2}$

_____23. Find $\frac{dy}{dx}$ if $x^2+y^2=-2xy$

a) 1 b) -1 c) $\frac{x-y}{x+y}$

d) $\frac{x+y}{x-y}$ e) $-\frac{x+2y}{x}$

_____24. The equation of the tangent line to the graph of $x\cos y+y=x^2$ at the point $(1,0)$ is

a) $y=2x$ b) $y=x$ c) $y=x-1$

d) $y=-x+1$ e) $y=-x$

_____25. A 20 foot ladder leans against the wall of a building. The ladder starts sliding down the wall so that the top of the ladder moves down at the rate of 0.5 ft/sec. How fast is the foot of the ladder moving away from the wall when the foot of the ladder is 12 feet from the wall?

a) 0.5 ft/sec b) $\frac{5}{8}$ ft/sec c) $\frac{2}{3}$ ft/sec

d) $\frac{4}{3}$ ft/sec e) $\frac{8}{3}$ ft/sec

_____26. A spherical balloon is filled with air at $8 \text{ in}^3/\text{sec}$. How fast is the diameter of the balloon increasing when the volume of the balloon is $36\pi \text{ in}^3$?

a) $\frac{4}{9\pi}$ in/sec b) $\frac{2}{3\pi}$ in/sec c) $\frac{2}{9\pi}$ in/sec

d) $\frac{8}{27\pi}$ in/sec e) $\frac{2}{27\pi}$ in/sec

_____27. The absolute minimum of $f(x) = x^2 - 2x + 3$ on the interval $[0,5]$ is

a) -1 b) 0 c) 1 d) 2 e) 15

_____28. The relative minimum of the function $f(x) = 2x^3 - \frac{5}{2}x^2 - 4x + 2$ on the interval $[-1,2]$ is at $x =$

a) -1 b) $-\frac{1}{2}$ c) $\frac{4}{3}$ d) $\frac{5}{3}$ e) 2

_____29. On what interval if $f(x) = x^3 + x$ concave down?

a) $(-\infty, \infty)$ b) $(0, \infty)$ c) $(-\infty, 0)$

d) $(0,1)$ e) $(-1,0)$

_____ 30. The x-coordinates of the point(s) of inflection of $f(x)=\frac{x}{x^2+1}$ is (are)

a) 0 b) ± 1 c) $\pm\sqrt{3}$

d) 0 and $\pm\sqrt{3}$ e) No points of inflection

_____31. Which of the following is a hypothesis of Rolle's Theorem *not* satisfied by $f(x)=\frac{2}{x-1}$ on the interval $[3,5]$?

a) f is continuous on $[3,5]$ b) f is differentiable on $(3,5)$

c) $f(3)=f(5)$ d) $f'(c)=0$ e) $f'(x)$ is defined on $[3,5]$

_____32. Find the value of c guaranteed by the Mean Value Theorem for $f(x)=\frac{2}{x-1}$ on the interval $[3,5]$.

a) $1+2\sqrt{2}$ b) $2\sqrt{2}$ c) $1+\sqrt{2}$

d) 2 e) $1-2\sqrt{2}$

A calculator should be used on this section.

_____33. On the interval $[-\pi, \pi]$, the function $f(x) = 2\cos x - \sin 2x$ has

a) One relative maximum and one relative minimum
b) One relative maximum and two relative minima
c) Two relative maxima and one relative minimum
d) Only a relative maximum
e) Only a relative minimum

_____34. On what parts of the interval $[-2,2]$ is the graph of $f(x) = x\sin x^2$ concave up?

a) $(0,1)$ b) $(0,0.994)$ c) $(-1,1)$

d) $(-0.994, 0.994)$ e) $(0,0.994)$ and $(-2,-0.994)$

_____35. At what value(s) x in the interval $[0,2]$ in the slope of the line tangent to $f(x) = x^3 - 3x^2$ equal to the slope of the line joining $(0, f(0))$ and $(2, f(2))$?

a) 0 b) 0.423 c) 1.577 d) 2 e) 0.423 and 1.577