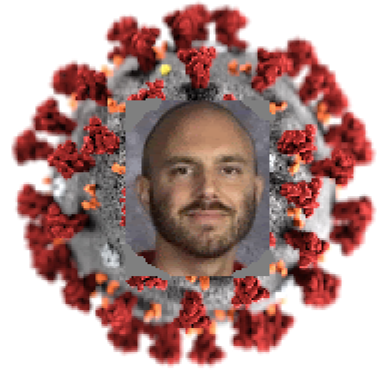
CoronaCuestions for Week 5



<u>**Use Desmos or a graphing calculator at will. Some questions require it!**</u>

- **If you don't know how to do integrals on desmos, there is an example in my video on 04/03/20**

Question 3

t (minutes)	0	1	4	8	10
$G(t)$ (degrees Celsius)	68	61	55	49	48

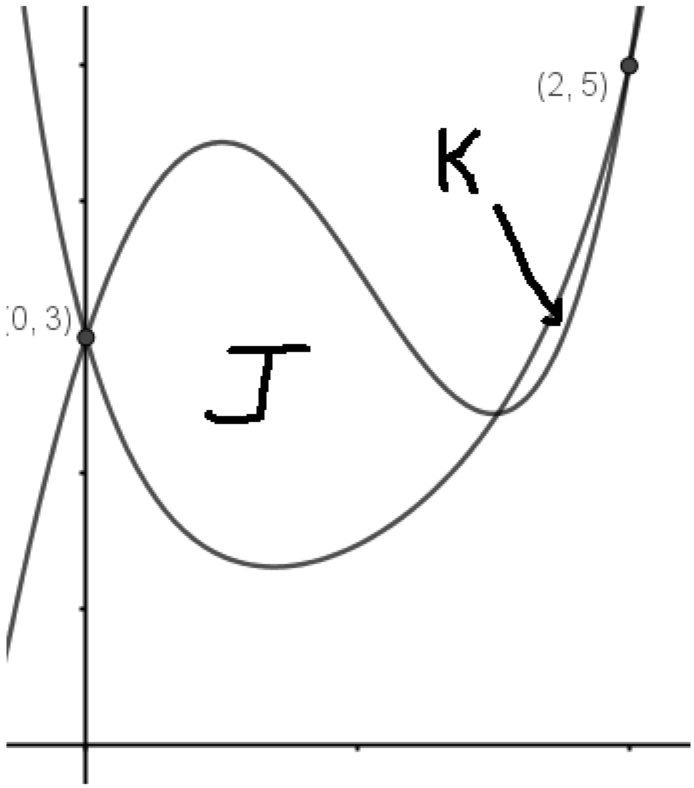
As a potato cools, the temperature of the potato is modeled by a differentiable function G for $0 \le t \le 10$, where time t is measured in minutes and temperature $G(t)$ is measured in degrees Celsius. Values of $G(t)$ at selected values of time t are shown in the table above.

(a) Use the data in the table to approximate the rate at which the temperature of the potato is changing at time $t = 2.5$. Show the computations that lead to your answer.

(b) Evaluate $\int_0^{10} G'(t)dt$. Using correct units, explain the meaning of the expression in the context of this problem.

(c) At time t = 0, enchiladas with temperature 80˚C were removed from an oven. The temperature of the enchiladas at time t is modeled by a differentiable function E for which it is known that $E'(t) = -9.02e^{-0.183t}$. Using the given models, at time t = 10, how much cooler are the enchiladas than the potato?

Question 4



Let g and h be the functions defined by $g(x) = -1 + x + 4e^{x^2-2x}$ and $h(x) = x^4 - 6.5x^2 + 6x + 3$. Let J and K be the two regions enclosed by the graphs of g and h shown in the figure above.

(a) Let d be the vertical distance between the graphs of g and h in region J. Find the rate at which d changes with respect to x when $x = 0.6$.

Question 5:

- **Reminders**
  - **d/dt(position) = velocity**
  - **d/dt(velocity) = acceleration**
  - **Indefinite integral(velocity)dt = position**
  - **Definite integral(velocity)dt = change in position aka displacement**
  - **Indefinite integral(acceleration)dt = velocity**
  - **Definite integral(acceleration)dt = change in velocity**
  - **Speed = |velocity|**
  - **(a) Short and sweet is what you're looking for with justifications, don't make more claims than you need.**
  - **(b) you'll have to round a step if using desmos (usually you don't want to round anything until the very end) but it winds up not mattering.**

For $1 \le t \le 7$, a particle is moving along the x-axis. The particle's position, $x(t)$, is not explicitly given. The velocity of the particle is given by $v(t) = 2\sin(\ln(3t)) - 1$. The acceleration of the particle is given by $a(t) = \dfrac{2cos(ln(3t))}{t}$ and $x(1) = 2$.

(a) Is the speed of the particle increasing or decreasing at time $t = 6$? Give a reason for your answer.

(b) For $1 \le t \le 7$, the particle changes direction exactly once. Find the position of the particle at that time.

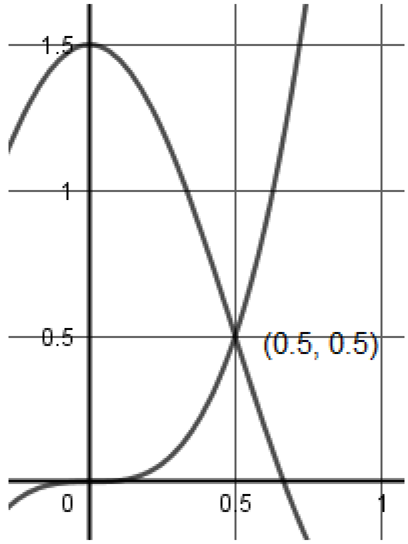
Question 6

Let f be a function defined by $f(x) = \begin{cases} 2 - sinx & x \leq 0 \\ 2e^{-3x} & x > 0 \end{cases}$.

(a) Show that f is continuous at $x = 0$.

(b) For $x \neq 0$, express $f'(x)$ as a piecewise-defined function. Find the value of x for which $f'(x) = -2$.

Question 7



Let *S* be the region in the first quadrant enclosed by the *y*-axis, and the graphs of $f(x) = 4x^3$ and $g(x) = \cos(\pi x)$, as shown in the figure above.

(a) Write an equation for the line tangent to the graph of *f* at $x = 0.5$.

Question 8

t (minutes)	0	8	22	28	30
$v(t)$ (feet per minute)	0	600	720	-660	450

Stephanie jogs along a straight path. For $0 \le t \le 30$, Stephanie's velocity is given by a differentiable function v. Selected values of $v(t)$, where t is measured in minutes and $v(t)$ is measured in feet per minute, are given in the table above.

(a) Use the data in the table to estimate the value of $v'(25)$.