In the diagram below, imagine that the point Q is moving along the x axis toward the point P (which is not moving). The point M is directly above the point P. The point N rides along on the graph y=f (x) directly above the point Q. Thus the line L, which connects points M and N, changes as N moves.

i) As the point Q moves toward point P, the slope of line L: increases/decreases/stays the same/ impossible to tell.

ii) As the point Q moves toward point P, the vertical distance between M and N, indicated by "v" in the diagram: increases/decreases/stays the same/ impossible to tell

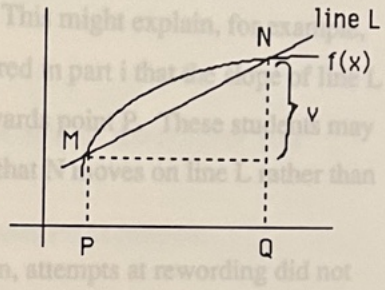

Figure 16: Question Two of the Calculus Assessment Test

i) Draw a function f(x) for which f (-x) = -f (x) for all x.

ii) Suppose that f(x) is a differentiable function such that f (-x) = -f (x) for all x. Then for any given constant "a"

A) f ' (-a) = - f ' (-a)
B) f ' (-a) = f ' (a)
C) f ' (-a) = - f ' (a)
D) None of the above

Figure 17: Question Three of the Calculus Assessment Test

On the axes below, draw a graph that could represent the following sequence of events:

The child's temperature was rising. The child was given some aspirin. The child's temperature is still rising, but the aspirin seems to be taking effect.

Be sure to label your axes and indicate what part of your graph represents the situation before giving aspirin, and what part of the graph represents the situation after giving aspirin.

Figure 18: Question Four of the Calculus Assessment Test

A person takes aspirin at 11:30 a.m. By 12:00 noon, the aspirin is completely absorbed into the bloodstream. Each hour, the kidneys remove a fixed percent of the amount of aspirin that was in the bloodstream at the beginning of that hour. Sketch the shape of a possible graph which indicates how the aspirin level in the bloodstream changes over the 6-hour period from 12:00 noon to 6:00 p.m. Be sure to label your axes.

Figure 20: Question Five of the Calculus Assessment Test

Suppose f (x) is a continuous function and "k" is a constant. Rewrite the equality below, replacing the question marks with appropriate limits of integration. You may find it helpful to make a sketch.

$$\int_{a}^{b} f(x-k)dx = \int_{?}^{?} f(x)dx$$

Figure 24: Question Seven of the Calculus Assessment Test

Let f (x) be a continuous, differentiable function. Some values of f (x) are given in the table below:

x	f(x)
1.00	3.00
1.90	-7.00
1.99	-8.00
2.00	-9.00
2.01	-6.00
2.10	-5.00
2.50	0.00

x	f(x)
2.900	25.340
2.990	33.970
2.999	34.896
3.000	35.000
3.001	35.104
3.010	36.050
3.100	46.180

i) *Give as accurate an estimate as possible of the derivative of f (x) at x=3. Show your work.*

ii) *One root of f (x) is at x=2.5. Does f (x) have any other roots on the interval [1, 3.1]? Explain your answer.*

iii) *Does* $\lim_{x \to 2} f(x)$ *exist? If so, what is its value? If not, explain why.*

Figure 26: Question Eight of the Calculus Assessment Test

Set up an expression that represents the total area of the shaded region in the diagram below:

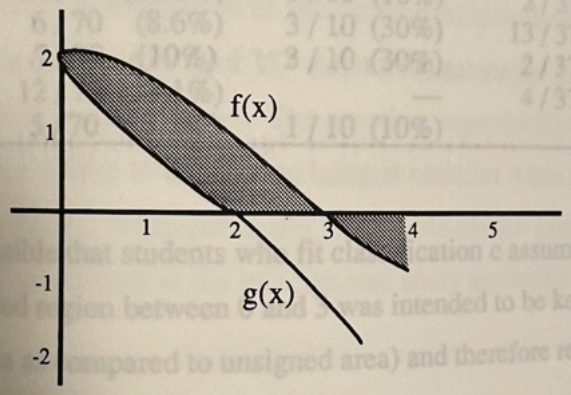

Figure 27: Question Nine of the Calculus Assessment Test

The graph of the function $y=f(x)$ is shown below for $0 \le x \le 4$. For what value of "a" does $\int_0^a f(x)dx$ attain its greatest value?

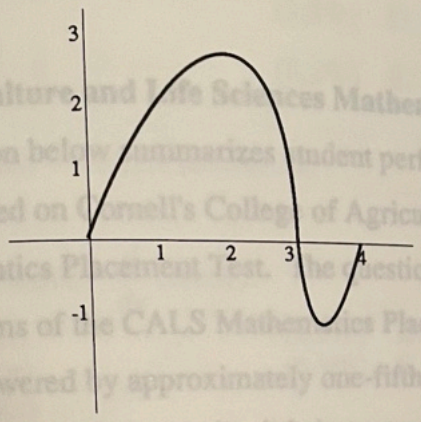

Figure 28: Question Ten of the Calculus Assessment Test