Advanced Calculus

AB.Q403.REVIEW ASSESSMENTS (PART D)

DERIVATIVES AND APPLICATIONS

(20 points)

NO CALCULATORS

NAME:

DATE:

BLOCK:

I (*print name*)________________________________ certify that I wrote and fully understand **all** marks made in this assessment. I did not write anything that I do not understand. I would now, having completed this assessment, be able to make similar (but equally accurate) responses if asked complete the same exact assessment on my own.

Signature:

1. Let $f(x)=\begin{cases} 5-(1-x)^{5/2}\ ; x<1 \\ 6-(2-x)^{2}\ ; x\geq 1 \end{cases}$

(a) Is *f* continuous at $x=1$? Why or why not?

(b) Find the absolute maximum and the absolute minimum value of *f* on the closed interval $-1\leq x\leq 4$. Box your answer. Show the analysis that leads to your conclusion.

2. Use Lagrange (*prime*) notation to express the following derivatives

A. $[f(g(x)+2)]'$

B. $[\ln(f(x))+g(2x)]'$

C. $[f^2(x)\cdot h(g(x))]'$

3. Let $f(x)=-x^5-x^3-x-5$ and $g(x)$ be the inverse function of *f*. Find $g'(-2)$.

4. Find the derivative of $\sin^{-1}(2x^2)$

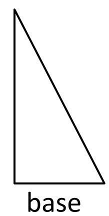
5. Consider the curve C: $\sin(xy) + 2y = x + y^2 + \frac{4-\pi}{4}$

A. Find $\frac{dy}{dx}$.

B. Find the equation of the line tangent to the curve at the point $\left(\frac{\pi}{4}, 2\right)$

6. Consider the curve C: $\sqrt{3}\,y + 2\sin y = 1 + x^3$ for $0 \le y \le \pi$.
Find a point on the graph of C where the tangent line to C is vertical.

7. A chemical leak in the corner of a science laboratory room makes the shape of a right triangle on the floor. The triangle grows in such a way that the height is always three times the base. The length of the base is growing at the rate 7/10 feet per second at the very instant the base is 5/3 feet in length.



A. Find the rate at which the area of the triangle is growing at the instant the base is 5/3 feet in length. Include the units of measure.

B. Find the rate at which the hypotenuse of the right triangle is growing at the instant the base is 5/3 feet in length. Include the units of measure.

C. The rate of change of the total temperature of the triangle is modeled by the function $T'(t) = t\left(t^2+1\right)^4$ units per second. Based on this model, what was the temperature increase from time one to two seconds?