Calculus ’21-22 Name___________________________

Integral Test

Score_____________

1. Evaluate $\int_1^4 \left(\frac{x^5 - 4x^2 - 5}{x} \right) dx$ Show the antiderivative step.

2. Evaluate $\int_0^1 x^2 \sqrt{9 - x^3}\, dx$. Show the u-sub and antiderivative.

3. Evaluate $\int_0^{\ln 2} e^x\left(2-e^x\right)^5 dx$. Show the *u*-sub and antiderivative.

4. Find the average value of $y=x^2+2x+4$ on $x\in\left[-1,2\right]$. Show the *u*-sub and antiderivative.

5. Consider the function $y = x^2 - 4x - 5$.

a) Draw the graph of $f(x)$ on $x \in [1, 7]$.

b) Prove that the zeros of $f(x)$ are at $x = -1$ *and* 5 .

c) Find the exact value of $\int_1^7 f(x)\,dx$. Show the antiderivative and boundary insertion steps.

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d) Find the exact area between the x-axis and $f(x)$ on $x \in [1, 7]$. Show the set-up, but solve using the calculator.

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6. Let f be a differentiable function on the closed interval [1, 13] and which has values as shown on the table below.

x	1	5	10	13
$f(x)$	3	8	6	11

a) Using the sub-intervals defined by the table values, use the left-hand Riemann sum to approximate $\int_1^{13} f(x)\,dx$.

b) Using the sub-intervals defined by the table values, use the trapezoidal sum to approximate $\int_1^{13} f(x)\,dx$

c) Approximate $f'(10)$

7. The velocity of a particle moving along the x-axis is given by $v(t) = 3t^2 + 10t - 8$.

a) Find the displacement of the particle between $t = -2$ and $t = 5$. Show the set-up and the antiderivative before using the calculator to find the answer.

b) Find the total distance traveled by the particle between $t = -2$ and $t = 5$. Show the set-up but use the calculator to find the answer.

EC. Dr. Quattrin's grandmother's family originated in the Alpine town of Sauris, Italy, where the temperature in January changes at a rate of $W(t)$ degrees Celsius per hour. $W(t)$ is a twice-differentiable, increasing and concave up function with selected values in the table below. At midnight ($t=0$), the temperature in Sauris is $-8°C$.

t (in hours after midnight)	0	1	3	6	8
$W(t)$ (in degrees Celsius per hour)	-2.6	-3.1	-1.2	1.9	2.5

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a) At approximately what rate is the rate of change of the temperature changing at 2am ($t=2$)? What would the symbol be? What would the units be?

b) Using correct units, explain the meaning of $\frac{1}{8}\int_0^8 W(t)\,dt$ in the context of this problem.