

Name _____

- You have 20 minutes
- No calculators
- Show sufficient work

1. (2 points) Fill in the missing information for the following two theorems.

Rolle's Theorem Let f be a function that satisfies the following three hypotheses.

(1) f is _____ on the closed interval $[a, b]$.

(2) f is _____ on the open interval (a, b) .

(3) _____ .

Then there is a number c in (a, b) such that _____ .

Mean Value Theorem Let f be a function that satisfies the following two hypotheses.

(1) f is _____ on the closed interval $[a, b]$.

(2) f is _____ on the open interval (a, b) .

Then there is a number c in (a, b) such that _____ .

2. (2 points) Evaluate the definite integral. Simplify your answer.

$$\int_1^2 \frac{-180x^2}{(x^3 + 2)^2} dx$$

3. (2 points) Evaluate the indefinite integral.

$$\int \frac{15x^9}{\sqrt{x^5 + 2}} dx$$

4. (2 points) Evaluate the indefinite integral.

$$\int 100e^{5x} \sin(e^{5x}) \cos^9(e^{5x}) dx$$

5. (2 points) Let \mathbf{R} be the finite region bounded by the given functions. In the following way, set up but do not evaluate definite integrals which represent the area of the region \mathbf{R} .

$$y = 4 \ln(x)$$

$$y = 0$$

$$y = 2$$

$$y = x + 1$$

(a) Integrate with respect to x .

(b) Integrate with respect to y . (The integrands in parts (a) and (b) should be different.)