

Name: _____

1. Fill in the blanks (short answers).

(a) Let f be a function. Rolle's theorem states that if f is _____ on $[a, b]$, if f is _____ on (a, b) , and if $f(a) =$ _____, then there exists a value c in $[a, b]$ such that _____.

(b) True or False: _____

$$\int_a^b f(x)g(x) = \int_a^b f(x) \int_a^b g(x)$$

(c) True or False: _____

If f is continuous on $[a, b]$, then f attains both an absolute maximum and an absolute minimum on that interval.

(d) Suppose f has a local minimum at c and that f is differentiable at c . Then $f'(c) =$ _____.

2. Estimate the area under the curve $y = 1 + x^2$ that is above the x -axis, and between the lines $x = -1$ and $x = 2$. Use $n = 3$ subintervals and use the left endpoint of each interval as the sample points. Is your estimate too large or too small?

3. Let $f(x) = x - 2\sqrt{x}$.

(a) Find where f is increasing and decreasing.

(b) Determine where f has local maxima or minima.

(c) Find where f is concave up, concave down, and where it has inflection points.

4. Evaluate the following limits:

$$(a) \lim_{t \rightarrow \infty} \frac{3t^2 - 9}{t^2 + 2t + 13}$$

$$(b) \lim_{x \rightarrow \infty} \cos\left(\frac{2x}{x^2}\right)$$

$$(c) \lim_{x \rightarrow \infty} (x - \sqrt{x})$$

5. Give the most general anti-derivative of the function:

(a) $f(x) = x^2(3 + x)^2$

(b) $f(x) = \cos 4x - 2x^{2/3}$

6. Determine the function f if $f''(x) = 2 + \cos x$, $f(0) = 1$, and

$$f(\pi/2) = 0$$

7. Find the dimensions of the rectangle of largest area that can be inscribed in an equilateral triangle of side length L if one side of the rectangle lies on the base of the triangle.