

18.014 QUIZ II

This quiz has two pages. If you have any questions, please ask.

1. (24 points) Assume f is defined on the interval $[a, b]$.

- (a) State the extreme value theorem for f .
- (b) State the mean value theorem for f .
- (c) State the first fundamental theorem of calculus for f (the one about the derivative of the integral).

Make sure you include the hypotheses for each theorem.

2. (16 points) Compute the following limit; state what limit theorems you are using.

$$\lim_{h \rightarrow 0} \frac{(h+2)^3 - 8}{h(h-2)}.$$

3. (24 points) Find $f'(x)$ if

(a)

$$f(x) = \int_{x^2}^{x^3} \frac{1}{1+t^4} dt.$$

(b)

$$f(x) = \sqrt{x^3 + 5\sqrt{x+1}}.$$

(c)

$$f(x) = \sin^2(\cos^2 x).$$

4. (16 points) Let $f(x)$ be continuous for all x except $x = 2$. Let

$$g(x) = \begin{cases} x^2 & \text{for } x \geq 0 \\ x^2 + 1 & \text{for } x < 0. \end{cases}$$

For what values of x can you be sure that the function $h(x) = f(g(x))$ is continuous?

5. (20 points) The following table was computed for the strictly increasing function f and its first two derivatives. (Assume f' and f'' exist for all x .)

x	$f(x)$	$f'(x)$	$f''(x)$
0	-2	3	-2
1	0	3/2	-1/2
2	1	1	0

Let g be the inverse function to f . Find the values of $g(0)$, $g(1)$, $g'(0)$, and $g''(0)$.

GOOD LUCK!