

CONCORDIA UNIVERSITY
DEPARTMENT OF MATHEMATICS AND STATISTICS

MATH 203: Calculus I

MIDTERM TEST

Instructor: Dr. Ming Mei

Questions

1. [15pts] Let $f(x) = ex^3 - 6$ and $g(x) = ex - \pi$, find $(g \circ f)(x)$, the inverse $(g \circ f)^{-1}(x)$, and their domains and ranges, respectively.

2. [20pts] Evaluate the limits

$$(a) \quad \lim_{x \rightarrow 1^-} \frac{|x - 1|}{x^2 - x}, \quad (b) \quad \lim_{x \rightarrow 0} \frac{\sqrt{6x + 1} - 1}{x}.$$

3. [15pts] Find parameters a and b such that the function

$$f(x) = \begin{cases} 1, & \text{if } x \leq 0 \\ b(x - 1)^2 + a, & \text{if } 0 < x \leq 1 \\ 5x + 3, & \text{if } x > 1 \end{cases}$$

will be continuous at all points.

4. [50pts, 10pts for each] Find derivatives:

(a) $y = \pi + ex^2\sqrt{x + 1}$;

(b) $y = \frac{\sin x}{e^x}$;

(c) $y = \sin \sqrt{1 - \sin^2 x}$;

(d) $x^2y^8 + x^2y^2 = x + y$;

(e) $y = x^{\ln x}$.
