

Math 1710 Section 3
Midterm 1 - Review

I. Find the average rate of change of the following functions over the given intervals.

1. $f(x) = x^2 - 2x$, $[-3, 1]$

2. $g(x) = \frac{1}{x-5}$, $[7, 9]$

3. $h(x) = |x|$, $[-6, 6]$

II. Find a positive number δ such that if $|x - a| < \delta$, then $|f(x) - f(a)| < \varepsilon$.

4. $f(x) = \sqrt{2x + 6}$, $a = 5$, $\varepsilon = 2$

5. $f(x) = x^2$, $a = 3$, $\varepsilon = 1$ (hint: δ won't be rational)

6. $f(x) = \frac{1}{x}$, $a = 2$, $\varepsilon = \frac{1}{100}$ (hint: watch your inequalities)

III. Find the following limits.

7. $\lim_{x \rightarrow -\infty} \frac{3x^4 - 50x^3 + x - 10}{15x^4 + 3x}$

8. $\lim_{x \rightarrow \infty} \frac{x^2 + 1}{-3x^3 - 5x^2 + 4}$

9. $\lim_{x \rightarrow \infty} \frac{-3x^3 - 5x^2 + 4}{x^2 + 1}$

10. $\lim_{x \rightarrow -\infty} \frac{-x^6 + 5}{3x^3 + x}$

11. $\lim_{x \rightarrow 0} \frac{\sin 3x}{5x \cos x}$

12. $\lim_{x \rightarrow 0} \frac{\sin 3x \cot 5x}{x \cot 4x}$

IV. Find the derivatives of the following functions.

13. $f(x) = \frac{3x^2 - 2}{x}$

14. $g(x) = \sqrt{x^2 + 2x}$

15. $h(x) = \sin x \cos x$

16. $k(x) = (x + 2)^7(x - 5)^4$

17. $f(x) = x^2 \sin \frac{1}{x}$

V. Use implicit differentiation to find $\frac{dy}{dx}$.

18. $x^2 = \frac{x-y}{x+y}$

19. $x + \sin y = xy$

VI. Miscellaneous

20. Let $f(x) = \sin(2x)$. Find the sixth derivative of f .

21. Find the derivative of $g(x) = \sqrt{2x + 5}$ from definition.

22. Find $\lim_{x \rightarrow 2^-} \frac{-x}{(x+3)(x^2+4x+4)}$.