Math 181 Honors Practice Exam 1 Version A

1. Find the domain of $f(x) = \sqrt{x^2 + 1}$.

2. Evaluate the sum $\sum_{k=2}^{6} \frac{k}{5}$.

3. Compute in any way $\lim_{x \to 1} \frac{x}{x+3}$.

4. Compute in any way $\lim_{x \to \infty} \frac{2x + 17}{x^2}$.

5. Convert the repeating decimal $1.\overline{43}$ to a fraction.

6. Use induction to show $1 + 3 + 5 + \cdots + (2n - 1) = n^2$ for every positive integer n.

7. Solve the inequality $|2x - 1| < 5$.

8. Use δ-ϵ definition of limit to verify $\lim_{x \to 1} \dfrac{1}{x+2} = \dfrac{1}{3}$.

9. Solve the inequality $\dfrac{x-5}{x-3} \leq 2$.

10. Use the method of increments to find $\dfrac{dy}{dx}$ when $y = 2x^3$.

11. Work only one of the following problems.

(i) Suppose $y = 1/u$ where u depends on the variable x. Use the method of increments to verify that

$$\frac{dy}{dx} = -\frac{1}{u^2}\frac{du}{dx}.$$

(ii) Suppose

$$\lim_{x\to 1} f(x) = 2 \qquad \text{and} \qquad \lim_{x\to 1} g(x) = 3.$$

Use the δ-ϵ definition of limit to verify $\lim_{x\to 1}\big(f(x)g(x)\big) = 6$.