Math 152 Exam III Name:_____

1. Complete each sentence:

A sequence is ...

A series is ...

2. State 2 definitions of $\lim_{x\to 3} f(x) = 1972$, one an informal definition suitable for explaining the concept to a fellow calculus student, the second a formal mathematical definition suitable for proving theorems about limits.

Informal Definition:

Formal Definition:

3. Use an $\epsilon - \delta$ proof to show that $\lim_{x\to 2} x^2 + 3x = 10$.

Use an $\epsilon - N$ proof to show that $\lim_{n\to\infty} \dfrac{n+42}{n} = 1$.

4. Find the following limits. (An $\epsilon - \delta$ or $\epsilon - N$ proof is not necessary, but some justification is.)

a. $\lim_{x\to 0} \dfrac{\cos x - 1}{x^2}$

b. $\lim_{x\to 0} \dfrac{\sin(2x) - 2x}{x^3}$

c. $\lim_{x\to 1} \dfrac{2x^2 - 3x + 1}{x^2 + 2x - 3}$

d. $\lim_{x\to\infty} \dfrac{\ln x + x}{x^2 + e^{-x}}$

e: $a_n = \frac{\ln(n+1)}{\sqrt{n}}$

f: $b_n = \frac{n^{1981}}{e^n}$

g: $c_n = \frac{(\sqrt{10}n+\pi)(\sqrt{2}n-1)}{2n^2+18}$

[drawing space]

5. For each integral, determine if it converges or diverges.

$\int_0^\infty \dfrac{1}{x^{3/2}} dx$

$\int_1^\infty \dfrac{1}{x^2 + e^x} dx$

$\int_1^\infty \dfrac{1}{x + e^x} dx$

$\int_0^3 \dfrac{1}{(x-2)^{1/3}} dx$

6. For each of the following, find the limit by first taking the natural log of the sequence.

$a_n = n^{3/n}$

$b_n = (1 - \frac{2}{n})^n$

Extra Credit: (In honor of today's LGBT Day of Silence.) Name the city, year, and name given to the police attack and ensuing riot (it's the name of the bar where it started) which is generally credited as launching the modern day gay rights movement.