Calc II - Review 2

Our second exam is this coming Friday, March 29. Here are a few problems to study for that exam. As before, these should be quite relevant for the exam!

Team	Rating
Ohio State	100
UNC	85
UNCA	75
Michigan	-1000

1. Suppose that 50 teams play in a common league. I've developed the McClure rating that assigns a real number rating to each team with larger values associated with stronger teams. The ratings for a few teams are shown in the table above.

   Suppose that the pairwise, symmetric differences of the ratings have a mean of zero and a standard deviation of 10. Find the probability that Ohio State defeats UNC in their next game.

2. Use u-substitution to translate the following normal integral into a standard normal integral:
$$\frac{1}{\sqrt{2\pi}\,2}\int_{-2}^{3} e^{-(x+1)^2/8}dx.$$

3. I've got an unfair coin that comes up heads 3/4 of the time. Suppose I flip that coin 800 times, count the number of heads I get, and call that value S.

   a) Find $E(S)$ - i.e. the mean or expectation of S.

   b) Find $\sigma^2(S)$ and $\sigma(S)$ - i.e. the variance and standard deviation of S

   c) Write down a normal integral that represents $P(590 < S < 620)$.

4. Use the limit laws for sequences to explain clearly why
$$\lim_{n\to\infty}\frac{3n+2}{4n-3} = \frac{3}{4}.$$

5. Evaluate the following limits

   a) $\lim_{n\to\infty} \dfrac{3n+2}{4n-3}$

   b) $\lim_{n\to\infty} \dfrac{3n^3-2n+2}{5n^3-2n-3}$

   c) $\lim_{n\to\infty} \dfrac{3n^3-2n+2}{5n^4-2n-3}$

   d) $\lim_{n\to\infty} \dfrac{2^n}{n!}$

6. Suppose that $a_0 = 2$ and $a_{n+1} = 2a_n - 1$. What is the value of a_4?

7. Explain clearly why

$$\sum_{n=1}^{\infty} \frac{n}{n+1}$$

   diverges.

8. Evaluate the sum

$$\sum_{n=1}^{\infty} \frac{2}{n(n+2)}$$

   by

   - Decomposing the term $2/(n(n+2))$ into partial fractions and then
   - Use the fact that the result teloscopes.

9. Use the geometric series formula to express

$$\sum_{n=2}^{\infty} (-1)^n \frac{3^{n+1}}{5^{n-1}}$$

   as a simple, finite combination of fractions.

10. Use the geometric series formula to express $0.21\overline{12}$ as a simple, finite combination of fractions.