Spring 2020 Math 152

Week 7 in Review

courtesy: David J. Manuel

(covering 7.8 and 11.1)

(Problems with a * beside them will also be done in Python)

1 Section 7.8

1. Evaluate the following integrals:

   (a) $\displaystyle\int_0^\infty e^{-3x}\,dx$

   (b) $\displaystyle\int_0^\infty xe^{-3x}\,dx$

   (c) $\displaystyle\int_2^\infty \frac{\ln x}{x^2}\,dx$*

   (d) $\displaystyle\int_1^\infty \frac{1}{x(x^2+1)}\,dx$

   (e) $\displaystyle\int_3^\infty \frac{x+1}{x^2-4}\,dx$

2 Section 11.1

1. Find the limits of the following sequences:

   (a) $a_n = \dfrac{\ln(n+e^{3n})}{n}$

   (b) $a_n = \left(1+\dfrac{3}{n}\right)^{n/2}$

   (c) $a_n = \arctan\left(\dfrac{n}{n+1}\right)$

   (d) $a_n = \arctan\left(\dfrac{n^2}{n+1}\right)$*

   (e) $a_n = \dfrac{(-1)^{n+1}}{2n+1}$

2. Find the limit of $a_n = (\sqrt{n+1}-\sqrt{n})\sqrt{n+\dfrac{1}{2}}$

3. Determine if the sequence $a_n = \dfrac{\ln n}{n}$ is monotonic and bounded.

4. Given the sequence defined recursively by $a_1 = 1$, $a_{n+1} = \sqrt{3+a_n}$ is increasing and bounded above by 3, find the limit.

5. Given $a_n = \dfrac{1000^n}{n!}$, show a_n is decreasing (for $n >$some N) and bounded below. What is the limit of this sequence, and why?