Math 2320 - Test 2

Name:____

1. $\displaystyle\int \frac{1}{(4-x^2)^{3/2}}\,dx$

2. $\displaystyle\int \frac{2x^2 - x - 1}{x^3 + x}\, dx$

3. State whether the series converges or diverges and why (show the four required pieces of information). If the series convrerges find its sum.

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

(b) $\displaystyle\sum_{n=2}^{\infty} 2 \cdot 3^{-n}$

4. State whether the series converges or diverges and why (show the four required pieces of information).

(a) $\displaystyle\sum_{n=1}^{\infty} \frac{2^n}{n!}$

(b) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$

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

(d) $\sum_{n=1}^{\infty} \frac{n!}{n^n}$

(e) $\displaystyle\sum_{n=1}^{\infty} \left[\frac{2n^2 + 3n - 1}{7n^3 + 1}\right]^n$

(f) $\displaystyle\sum_{n=1}^{\infty} \left[1 - \frac{1}{n}\right]^{n^2}$

5. Compute the interval of convergence and radius of convergence for the series

$$\sum_{n=1}^{\infty} \frac{(x+1)^n}{n3^n}$$

6. Compute the Taylor Series (from the formula) for $f(x) = \frac{1}{[1-2x]^2}$ at $a = 0$.

EC - Take home You now get to calculate π. Holiday Fun!

- Compute $4\tan^{-1}(1)$
- Now we will compute the Taylor series for $4\tan^{-1}(x)$ then plug in $x = 1$.
  - First recall the series: $\frac{1}{1-x} = 1 + x + x^2 + x^3 + \cdots + x^n + \cdots$
  - Now use the above series to compute the series $\frac{1}{1+x}$
  - Use the above series to compute the series $\frac{1}{1+x^2}$
  - Use the above series to find the series: $\tan^{-1}(x)$ (computing the integral)
  - Use the above series to compute the series: $4\tan^{-1}(x)$ (multiply both sides by 4).
- Take your series and plug in $x = 1$ and sum up the first four terms of the series and see how close your sum is to π.