Name: _____

Write all of your responses on this quiz paper, use the back if necessary. Show all your work, answers without supporting justification will not receive credit.

1. (*45 Points*): Test the series for convergence or divergence.

   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{3^n n^2}{n!}$

(b) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln(n)}}$

(c) $\displaystyle\sum_{n=1}^{\infty} \ln\left(\frac{n}{3n+1}\right)$

2. (*20 Points*): Find the radius of convergence and interval of convergence of the power series,

$$\sum_{n=1}^{\infty} \frac{(-1)^n 4^n}{\sqrt{n}} x^n$$

3. (*15 Points*): Find a power series representation for the function $f(x) = \dfrac{x^2}{x^4 + 16}$ and determine the radius of convergence.

4. (*20 Points*): Find the Taylor series for $f(x) = \ln(x)$ centered at $a = 2$.

5. **Extra Credit**: (*10 Points*): Find the exact sum of the series.

$$\sum_{n=0}^{\infty} \frac{(-1)^n \pi^n}{3^{2n}(2n)!}$$