Math 182 Honors Quiz 13 Version A

1. State Taylor's Theorem with the integral form of the remainder term.

2. State the ratio test for determining whether an infinite series converges.

3. Prove the integration by parts formula: If f' and g' are continuous then

$$\int f(x)g'(x)dx = f(x)g(x) - \int f'(x)g(x)dx.$$

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4. Solve the following integration problems:

(i) $\displaystyle\int_0^4 \sqrt{1+2x}\,dx$

(ii) $\displaystyle\int_0^{\pi/6} \sin^2 x\,dx$

(iii) $\displaystyle\int x \arctan(1+x^2)\,dx$

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

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5. Find the Taylor series with remainder for $f(x) = \ln(1 + x^2)$ expanded about $a = 0$.

6. Find $\lim_{x \to 0} \dfrac{xe^{-x^2} - \sin x}{x^3}$

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7. Determine whether the following infinite series converge and explain your answer.

(i) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n^3}$

(ii) $\displaystyle\sum_{n=1}^{\infty} \frac{\sqrt{n}}{(n+1)^{3/2}}$

(iii) $\displaystyle\sum_{n=237}^{\infty} \frac{n^2-1}{n!}$

(iv) $\displaystyle\sum_{n=13}^{\infty} \frac{1}{(\ln n)^n}$

8. Find the volume generated by rotating the region bounded by $x = 1$, $y = 1$ and $y = 5 - x^2$ about the x-axis.

9. Find the length of the arc given be $y = \frac{1}{8}x^2 - \ln x$ between $x = 1$ and $x = 2$.