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Name: _____

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Math 222

Prof. Beck

Final Exam

Fall 2004

1. For which values of x does the series

$$\sum_{n=1}^{\infty} \frac{\sec(2\pi n/3)}{\sqrt{n}} (\sqrt{2x})^n$$

converge?

For which values does it converge absolutely?

Prove your answer.

2. Evaluate:

$$\int e^{3x} \sin 2x dx.$$

3. Evaluate:

$$\int \csc x (\cot x)^2 dx.$$

4. To show that the sequence $\left\{ \frac{\sin(n\pi/6)\ln(n)}{n} \right\}$ converges to 0, let $\epsilon > 0$ be chosen.

Find an $N \in \mathbb{N}$ such that $n > N$ implies that

$$\left| \frac{\sin(n\pi/6)\ln(n)}{n} - 0 \right| < \epsilon.$$

5. Find the equation of the curve for which the difference of the distance from each point P to the point $(-2, 0)$ minus the distance to $(2, 0)$ is 2.

6. Integrate:

$$\int_0^4 \frac{1}{\sqrt{x}} dx.$$

Prove your answer.

7. Solve:

$$y' + 2y = \sin x.$$

8. Solve by variation of parameters:

$$y'' + y = \csc x \cot x.$$

9. State and prove the Cauchy-Bunyakovsky-Schwarz inequality.

10. Find the cosines of the angles in triangle ABC, where $A = (1, 0, 0)$, $B = (0, 2, 0)$ and $C = (0, 0, 3)$.