

MATH 242, Fall 2006
Final Exam: December 15, 8:00-10:00

Only the answer books will be graded. Please write your name and section number on the cover. Please circle final answers and cross out incorrect work. **You must justify all answers to receive full credit.** You may not use calculators, notes, or any other kinds of aids. **Each question is worth 10 points.**

1. In 1990, twenty wolves were introduced into a large wilderness area that has essentially unlimited food. In 1998, the wolf population had increased to 80. What will the wolf population be in 2010?
2. Simplify the expression $\sin^{-1}\left(\sin\left(\frac{3\pi}{2}\right)\right)$.
3. Find a cartesian representation of the polar curve $r = 4 \sin \theta$, and identify the curve.
4. Find the derivative of $e^{\sinh(5x)}$ at $x = 0$.
5. Evaluate $\int \frac{2^x}{1+2^x} dx$.
6. Evaluate, or show the divergence of, $\int_1^\infty \frac{ds}{(s+1)(s+2)}$.
7. Show that the parametric curve $x = t^2$, $y = t^3 - 4t$ has two tangent lines at the point $(4, 0)$, and find equations for both lines.
8. Find the value (sum) of the series $\sum_{n=1}^\infty \frac{1}{3^{2n-1}}$.
9. Find the Taylor polynomial $T_2(x)$ at $a = -1$ for the function x^3 .
10. Find $\lim_{x \rightarrow 0} \frac{e^{4x} - 1 - 4x}{x^2}$.

$$\frac{d}{dx} (\sin^{-1} x) = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx} (\tan^{-1} x) = \frac{1}{1+x^2}$$

$$1 - \sin^2 \theta = \cos^2 \theta$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

$$\sin^2 \theta = \frac{1}{2}(1 - \cos 2\theta)$$

$$\cos^2 \theta = \frac{1}{2}(1 + \cos 2\theta)$$

Logistic equation: $\frac{dP}{dt} = kP \left(1 - \frac{P}{K}\right),$

$$P(t) = \frac{K}{1 + Ae^{-kt}}, \quad A = \frac{K - P_0}{P_0}$$

θ	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{3\pi}{4}$	$\frac{5\pi}{6}$	π
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{1}{\sqrt{2}}$	$-\frac{\sqrt{3}}{2}$	-1
$\sin \theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0