LECTURE OUTLINE
Exam 2 Review

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Math 15

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Exam 2

Exam 2:

1 Problem Complex Numbers

1 Problem from Polar Problems.

2 Problems Taylor Series

2 Problems Chapter 6 Material

2 Problems Chapter 5 Material

$\geq 5/8$ Hw, $\leq 1/8$ synthesis, $\leq 1/8$ "theory", and the remainder based on book and class **examples.**

Complex

Express the following in the form $a + bi$

$$(2 + 5i)(7e^{i\frac{\pi}{4}}).$$

Polar

Suppose I slowly spin a ball so that it spins at a constant rate of $(1/8)\frac{rotation}{sec}$ around the axis $\hat{k} = \frac{1}{\sqrt{3}}(-\hat{x} - \hat{y} + \hat{z})$. Further suppose my ball has radius $.25ft$ and that my ball's spin is such that the direction $\hat{i} = \frac{1}{\sqrt{2}}(-\hat{x} - \hat{z})$ rotates towards $\hat{j} = \hat{k} \times \hat{i}$.

(a). Show $\hat{i}$, $\hat{j}$ and $\hat{k}$ are pairwise orthogonal and unit length.

(b) What is the position of a point that starts at $.25\hat{i}$ after $9seconds$ in the $\hat{x}$, $\hat{y}$, $\hat{z}$ coordinates .

Taylor

Let $P_n(x)$ be the nth Taylor polynomial at $x = 0$ for $f(x) = \frac{1}{2-x}$.

1. Find n large enough so that $|f(.5) - P_n(.5)| < .001$. Justify you answer.
2. Find the largest number r such that for $-r < x < r$ it true that $\lim_{n\to\infty} |f(x) - P_n(x)| = 0$. Justify you answer.
3. What is Taylor series for $f(x)$ centered around $x = 0$.
4. For which values of x (if any) does $f(x)$ equal the power series in part 3 and why.

Chapter 6: a theory example

Justify: $\vec{F} = -\nabla V$ implies that $\vec{F}$ is conservative.

Chapter 5

Show if $\vec{v}$ is in the same plane as $\vec{u}$ and $\vec{w}$ then the triple product of $\vec{v}$, $\vec{u}$, and $\vec{w}$ is zero.