What's going to be on the final?

Chap 7 Definite or indefinite integrals

- Integration by parts e.g. $\int (x^2+1)\sin x\,dx$
- Trig integral e.g. $\int \sec^4 x \tan^4 x\,dx$
- Trig substitution e.g. $\int \frac{x^2\,dx}{\sqrt{9-x^2}}$
- Partial fractions e.g. $\int \frac{x+9}{(x-1)^2(x+2)}\,dx$
- Improper integral e.g. $\int_0^\infty (x^2+3x)e^{-2x}\,dx$

  would involve integrating by parts (twice), L'Hopital's Rule

Chap 11

- Limits of sequences. (?)
- Geometric series, telescoping; sum, differences, multiples.

  e.g. $\sum_{n=1}^{\infty}\left[\left(\frac{2}{3}\right)^n + \ln(n+3) - \ln(n+2)\right]$ Does this converge? I don't think so.

- Integral test (?)
- Comparison tests. $\sum_{n=1}^{\infty} \frac{n+1}{\sqrt{n^3+1}}$ Does this converge? No.
- Alternating series. (Maybe one where the alternating series test does not apply.)
- Alternating series estimation of error (?)

Possible question type:

Produce an example of: A series $\sum a_n$ such that $\lim_{n\to\infty} a_n = 0$ yet $\sum a_n$ diverges.

... An alternating series which diverges.

... An example of a conditionally convergent series.

Later in Chapter 11 - Power series.

- Interval of convergence of power series (11.8)
- Operations with power series (11.9)
  like $\int \frac{x - \sin x}{x^3}\,dx$ or $\int_0^{.5} \frac{e^x - 1 - x}{x^2}\,dx$
- Produce a Taylor series for $f(x) = \sin x$ or $\cos x$ or $\ln x$ or e^x at $x = a$.
- Use $T_2(x)$ to approximate $f(1.2)$ to six decimal places.
- Taylor remainder (?)

Chap 10

- Eliminate the parameter in $\begin{cases} x = x(t) \\ y = y(t) \end{cases}$ (10.1)
  and graph, indicate orientation

e.g. $\begin{cases} x = t + 1 \\ y = \frac{1}{t} \end{cases}$ $\Rightarrow$ $t = \frac{1}{y}$ $\Rightarrow x = \frac{1}{y} + 1$

$\frac{1}{2} \leq t \leq 2$

$\Rightarrow x - 1 = \frac{1}{y}$

$\Rightarrow y = \frac{1}{x-1}$

Ch 10 (cont'd)

- $\frac{dy}{dx}$ or $\frac{d^2y}{dx^2}$ for parametric curve

or find the equation of a tangent line to a parametric curve, at $(2,3)$.

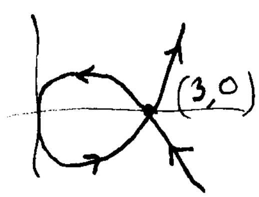
Example 1 (10.2): $\begin{cases} x = t^2 \\ y = t^3 - 3t \end{cases}$

a) Show that the curve has <u>two</u> tangents at $(3,0)$.

Find their equations.

Q: If $(x,y) = (3,0)$ what does that say about t?

Find t which satisfies BOTH equations



$$\begin{cases} 3 = t^2 \\ 0 = t^3 - 3t = t(t-\sqrt{3})(t+\sqrt{3}) \end{cases}$$

2^{nd} eqn has solns: $t = 0, \sqrt{3}, -\sqrt{3}$.

Which of these satisfy the 1^{st}

$t=0$? No, $\boxed{t=\sqrt{3}}$? yes $\boxed{t=-\sqrt{3}}$? yes

Then $\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{3t^2-3}{2t}$

So when ~~t0~~ $t=\sqrt{3}$ $\quad \frac{dy}{dx} = \frac{3(\sqrt{3})^2-3}{2(\sqrt{3})} = \frac{6}{2\sqrt{3}} = \frac{3}{\sqrt{3}} = \sqrt{3}$

when $t = -\sqrt{3}$ $\quad \frac{dy}{dx} = \frac{3(-\sqrt{3})^2-3}{2(-\sqrt{3})} = \frac{6}{-2\sqrt{3}} = \frac{-3}{\sqrt{3}} = -\sqrt{3}$

Tangent lines $y = \sqrt{3}(x-3)$

or $y = -\sqrt{3}(x-3)$.

From Ch 10 (cont'd)

- Area using polar coordinates

- Arc length ~~using~~ for a parametric curve.

- Nothing from 10.6.

- Probably no arc length with polar coordinates

- Definitely no area of region defined by a parametric curve.

Chapter 9

- Nothing