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Final Exam: Dec. 12 at 3:30pm
in CHBE 101.
(2.5 hours).

- HW10 - Due
- HW11 and Solutions posted
- not for marks for practice.
- Exam Review Posted.
- last year's exam posted
- Solutions to follow.
- Term Grades will be posted Friday.
- Complete MAPS (survey)
- Course Evals; do them.

How to Study and where to
get Problems?

- Learning Objectives.
- Practice Problems.
- HWs.
- Labs.
- Quiz
- Last year's Exam / review.
- Last year's Labs, HW, Quizzes,
Midterm.

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Still need to be able to work with these.

Topics:

- Review - trig, unit circle
- e^{2x} , $\ln x$
- $x^2 \cdot x^3 = x^5$

} no explicit exam questions

- Limits - limits will enter into the definition of derivative and integral.
- Asymptotes.

} may have to draw or explain but not compute.

- Definition of Derivative.

- State / explain / compute

- Compute Derivatives

- power, product, quotient, chain.

- Find Equations of Tangent Lines.

- Related Rates.

- Riemann Sums.

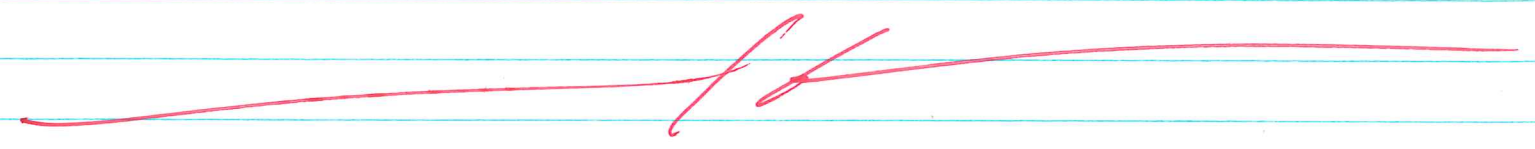
- state / explain definition of integral

- approximate area with rectangles
* right / left endpoints.

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- Definite / Indefinite Integrals
 - simple integrals
 - Substitution
 - integration by parts.
- Integral "word problems"

• Expect to draw a / some function(s).



Review: Substitution: $\cos x$ is derivative of $\sin x$.

• $\int \sin x \cos x \, dx$. take $u = \sin x$
 $du = \cos x \, dx$.

• $\int \underbrace{(x^2+1)}_u \cdot \underbrace{x}_{\text{kind of derivative of } x^2} \, dx$.

take $u = x^2 + 1$
 $du = 2x \, dx$.

Good choices for u include:

function inside another function.

• $\int e^x \sin(\underbrace{2+e^x}_u) \, dx$.

Things in denominators.

• $\int \frac{\sin x (\cos x + 1)}{\underbrace{\cos x}_u} \, dx$.

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Things in Square roots

$x = u - 1.$

• $\int (x^2 + 2) \sqrt{x+1} dx$

u

Integration by Parts.

$$\int u dv = uv - \int v du.$$

We differentiate u and integrate dv .

Choose u and dv to make the integral easier.

Ex: $\int x e^x dx$

u
 dv

gets easier.

$u = x$

$dv = dx$ doesn't change

$x e^x - \int e^x dx$

easier.

change much.

$dv = e^x dx$

$v = e^x$

- e^x , $\sin x$, $\cos x$: don't change much.
- x , x^2 , x^3 : get easier with diff.
- but can int. if necessary.
- $\ln x$: gets easier with diff.

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$$I = \sin^2 x - I$$

$$\Rightarrow dI = \sin^2 x$$

Sometimes these can be tricky.

$$+ \int \underbrace{\sin x}_u \underbrace{\cos x dx}_{du}$$

$$u = \sin x$$
$$\frac{du}{dx} = \cos x$$
$$du = \cos x dx$$

$$du = \cos x dx$$

$$u = \int \cos x dx$$

$$u = \sin x$$

$$= \sin^2 x - \int \sin x \cos x dx$$

move to left side

$$\int \sin x \cos x dx + \int \sin x \cos x dx = \sin^2 x$$

$$2 \int \sin x \cos x dx = \sin^2 x$$

$$\int \sin x \cos x dx = \frac{\sin^2 x}{2}$$

⑤

Definite Integrals: anti-derivative.

• $\int_a^b f(x) dx = F(b) - F(a)$.

• $\int_a^a f(x) dx = 0$.

