

141 Lecture 1

- Intro:
- Syllabus, ALEKS, Webassign.
 - college vs high school!

I. Intro to calculus

- study of change
- often involves limiting behavior as a quantity $\rightarrow 0$ or $\rightarrow \infty$

Ex 1. Interest 6% per year.

<u>Start</u>	<u>Year 1</u>	Year 2	Year n
\$100	$100(1.06)$		$100(1.06)^n$

- Monthly interest $\frac{1}{2}\%$ /m.

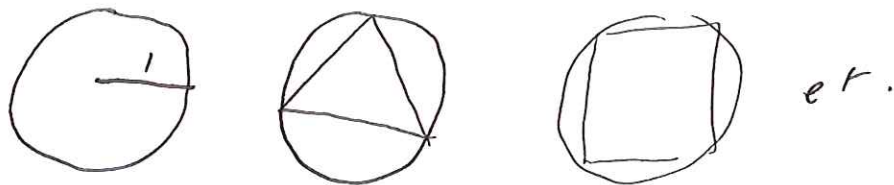
• Maple

annual r m times/yr
 $(1 + \frac{r}{m})^{mt}$ $m = Nr$
 $(1 + \frac{r}{m})$ Nr

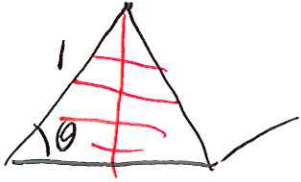
Conclude: $P(t) = P(0)e^{rt}$ $r = \text{annual rate}$

$\lim_{n \rightarrow \infty} (1 + \frac{1}{n})^n$ like $= e$

Ex 2 Regular n -gon radius 1



n	total \angle	each \angle
3	180	60
4	360	90
5	540	108
n	$180(n-2)$	$\frac{180(n-2)}{n}$



$$\theta = \frac{n-2}{2n} \cdot 180^\circ$$

$$\text{Area} = \cos \theta \cdot \sin \theta$$

Conclude Area of a regular n -gon inscribed in a circle of radius 1 is

$$n \cdot \cos\left(\frac{n-2}{2n} \cdot 180^\circ\right) \sin\left(\frac{n-2}{2n} \cdot 180^\circ\right)$$

Let $n \rightarrow \infty$ $\infty \cdot \overset{90}{\cos(180)} \overset{90}{\sin(180)} = \infty \cdot 0 \cdot 1$

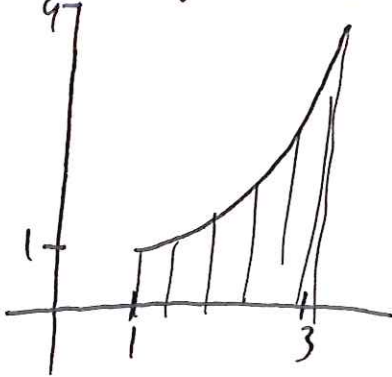
Maple Apple +

$$3 \cos(30^\circ) \sin(30^\circ) = 1.299$$

$$4 \cos(45^\circ) \sin(45^\circ) = 2$$

$$5 \cos(54^\circ) \sin(54^\circ) = 2.37$$

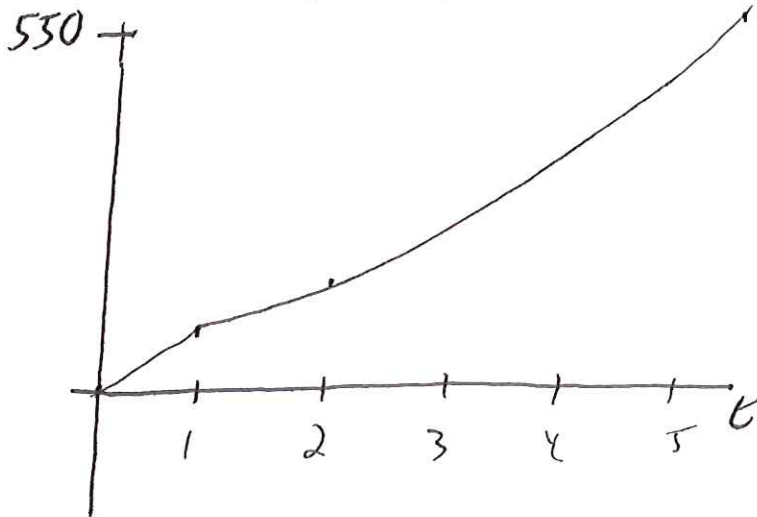
Ex 3 Find area under $y = x^3$ from $x = 1$ to $x = 3$



Application: $y = \text{speed}$
 $x = \text{time}$
 area = distance

Ex 4 $f(t)$ = miles driven after t hours. Suppose

$$f(t) = 20t^2 + 10t \quad 0 \leq t \leq 5$$



Questions

1. How far did we drive?
2. What was our average speed?
3. Average speed during hour 3? 4?
4. Were we speeding up? What was our accel?
5. Speedometer at $t=3$?

Maple
Apple t.

Abstraction Avg speed $t=3$ to $t=3+h$ is $\frac{f(3+h) - f(3)}{3+h-3}$

* slopes!