MAT194: Calculus

James Colliander

University of Toronto

Engineering Science

1. Course Information

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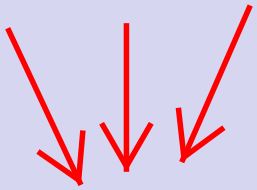

Download it from the Portal ASAP!

Basic Information for MAT194F Calculus
Engineering Science
2009

1. Your Lecturers

J. Colliander
Department of Mathematics
6110 Bahen Center
416 978 3645

P.C. Stangeby
Institute for Aerospace Studies
To arrange a meeting, please email: pcs@starfire.utias.utoronto.ca
Phone number: 416 667 7729

2. Lectures and Tutorials

Evaluation

- Two Term Tests 30%
- Tutorial Quizzes 20%
- Final Exam 50%

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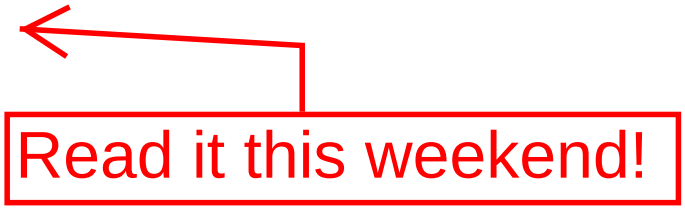
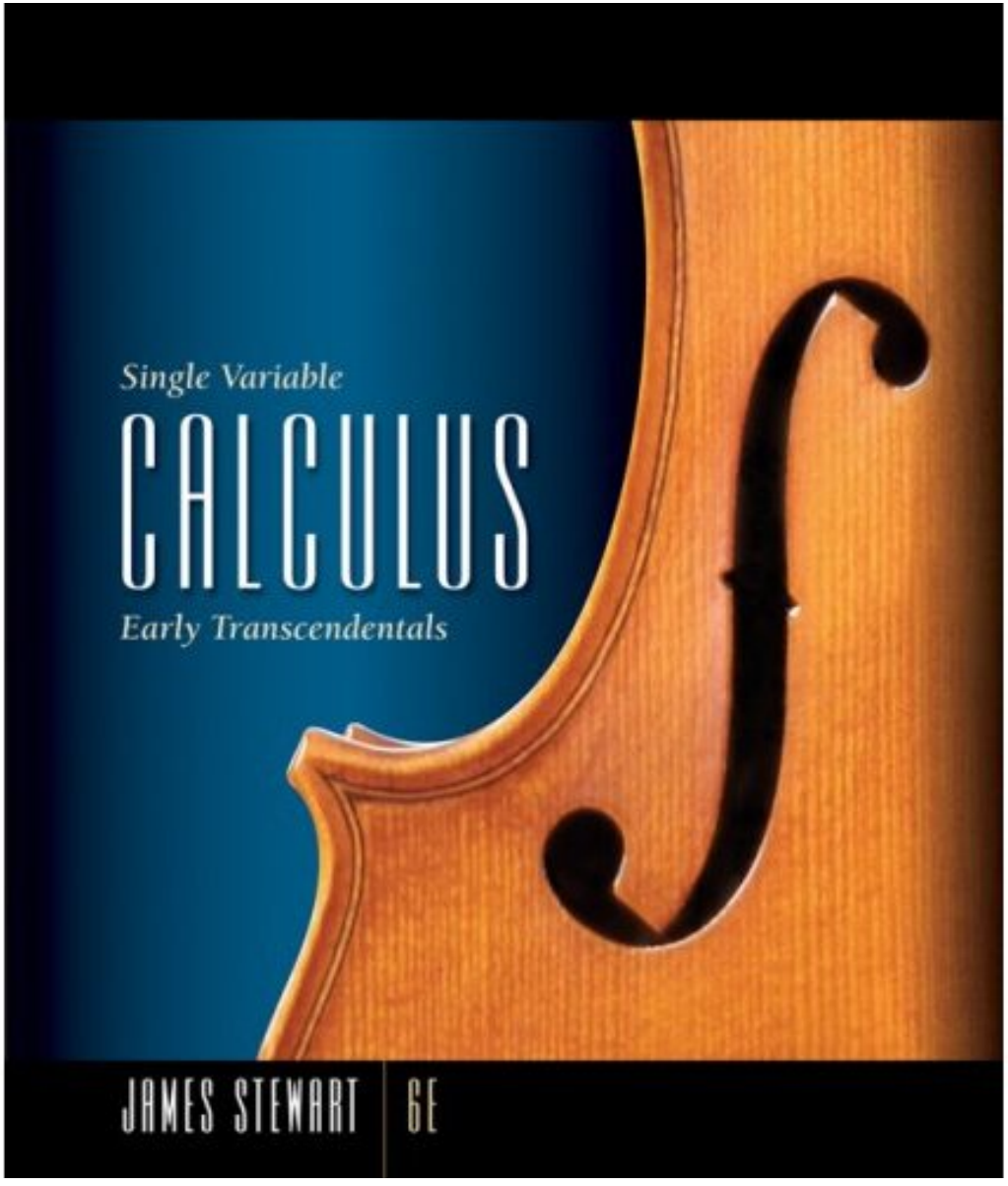
Textbook

- Stewart, Calculus 6E
- Supplement: Barbeau-Stangeby



Trig?

Textbook


Single Variable
CALCULUS
Early Transcendentals
JAMES STEWART
6E

Lecture Overviews

Basic Info Sheet

L1 A brief introduction, including: the problem of defining the derivative in a rigorously logical way; problem with a/0, 0/0, ∞; basic idea of the limit; the use of δ, ε ideas; the difference between f(c) and $\lim_{x \to c} f(x)$.

T: A preview of calculus, pages 2-9; Sec. 2.1.
TP: page 65: 3, 5
S: Sec. 1.

L2, L3, L4 The real number system, including: field and order axioms; absolute value; function; roots; intervals; increasing/decreasing; inequalities; intervals described by inequalities; inequalities involving δ, ε; triangle inequality. A brief introduction to trigonometry.

T: Secs. 1.1, 1.2, 1.3, Appendix D.
TP: pages 20-23: 18, 21, 23, 24, 31, 35, 39, 44, 56, 59, 63, 68; pages 34-37: 1, 2, 3, 4, 10, 15, 20, 23; pages 43-45: 3, 6, 7, 9, 17, 24, 26, 31, 38, 43, 58; pages 51-52: 2, 5, 24, 29,

2. Calculus Distilled

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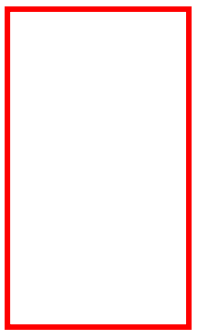
- Rectangle: Area = Base $\times$ Height.
- Slope: $\frac{\text{Rise}}{\text{Run}}$
- Limit: $\lim_{x \to c} f(x) = ?$.



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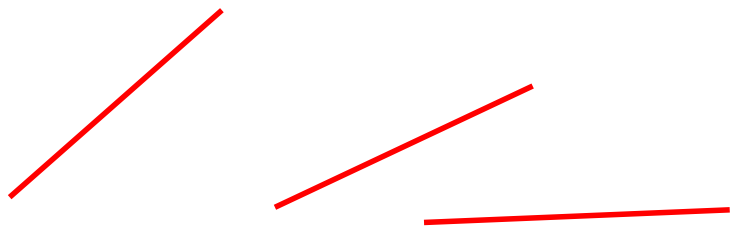

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3. Smooth Structure on Small Scales

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Calculus: A Toolbox for studying objects which behave nicely enough on small scales.

- Determinism; Time Evolution; Idea of Rate
- Optimization
- Smooth Geometry

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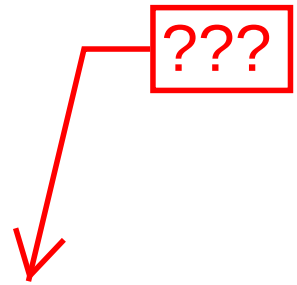

Calculus: A Toolbox for studying objects which behave nicely enough on small scales.

- Determinism; Time Evolution; Idea of Rate
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- Optimization ← Cheapest? Best?
- Smooth Geometry

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Calculus: A Toolbox for studying objects which behave nicely enough on small scales.

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- Optimization
- Smooth Geometry

Nonsmooth Examples

Inventors of Calculus

Inventors of Calculus

Gottfried Leibniz

Crushed by Newton....

Inventors of Calculus

Isaac Newton

Isaac Newton!

French mathematician Joseph-Louis Lagrange often said that

- J.L Lagrange: Newton was the greatest genius who ever lived, and once added that he was also "the most fortunate, for we cannot find more than once a system of the world to establish."
- Newton was rather more modest: In a letter to Robert Hooke, "If I have seen further it is by standing on the shoulders of Giants".(Though some historians think the above quote was an attack on Hooke who was short and hunchbacked, rather than or in addition to a statement of modesty.)
- I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the sea-shore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me.