Isaiah's Online Notes

Calculus I

Textbook: Calculus Early Transcendentals (Rogawski, 2008)

Yearly Plan

Unit 1 PreCalculus Review

Lesson #	Section	Topics	Assessments
1	Introduction	Course Overview, Welcome to Calculus, Fun Problems	
2	1.1	Notations used in class, Common Symbols, Review of Graphing	
3	1.2	Linear and Quadratic Functions	Quiz - Course Overview
4	1.3	Parent Functions, Transformations and Constructions	
5	EXTRA	Pascal's Triangle and Expanding Binomials	
6	1.4	Unit Circle, Trigonometric Functions	Quiz 1 - 1.1, 1.2, 1.3
7	1.4	Solving Trigonometric Functions and Word Problems	
8	1.4	Practice Trigonometric Word Problems	
9	1.5	Inverse Functions	
10	1.6	Exponential and Logarithmic Functions	
11	Geometry	Two and Three Dimensional Shapes	
12	EXTRA	Spherical Geometry and Non-Euclidean Geometries	Quiz 2 - 1.4, 1.5, 1.6
13	1.7	Calculators - How to use (Graphing, Equation Solving, Tracing)	
14	Review	Review Material	
15	Test 1	Test on Unit 1	Test 1

Unit 2 Introduction to Limits

Lesson #	Section	Topics	Assessments
16	2.1	Average Rate of Change	
17	2.1	Identifying an Overall Rate of Change and Curved Lines (modify AROC to get IROC)	
18	2.2	Limit at point, using a chart	
19	2.2/2.3	One-side Limits, Limits at infinity, Limit Laws	
20	EXTRA	What is Calculus, Why Study it?	Quiz 3 - 2.1-2.3
21	2.4, Infinity	Continuity and Discontinuity, Discuss Infinities	
22	2.5	Factoring Limits (Binomials and Trig)	
23	2.5	Factoring Limits (Conjugates, Fractions)	
24	2.5	Factoring Limits	
25	EXTRA	Who was Archimedes and how did he calculate Pi?	Quiz 4 - 2.4, 2.5
26	2.6	Squeeze Theorem	
27	2.6	Squeeze Theorem	
28	Review	Review Material	
29	Test 2	Test on Unit 2	Test 2

Unit 3 Limits Formally

Lesson #	Section	Topics	Assessments
30	2.7	Intermediate Value Theorem	
31	2.7	Intermediate Value Theorem	
32	2.8	Epsilon Delta Activity (Hands on, how to prove a limit exists?)	
33	2.8	Epsilon Delta Definition, Meaning, Proof Skeleton	
34	EXTRA	Logic, Proof Strategies - Direct, Indirect, Induction	Quiz 5 - 2.6, 2.7
35	2.8	Linear Examples	
36	2.8	Quadratic Examples	
37	2.8	Practicing Epsilon Delta Proofs	
38	3.1	Limit Definition of a Derivative (IROC and AROC revisited)	Quiz 6 - 2.8

39	3.1	Using the Limit Definition of a Derivative	
40	Review	Review Material	
41	Test 3	Test on Unit 3	Test 3

Unit 4 Derivative Rules

Lesson #	Section	Topics	Assessments
42	3.2	Notations and Terminology, Practice using Limit Definition, Find a pattern with x^n	
43	3.2	Power Rule and its Proof	
44	3.2	Horizontal Tangent Lines and Visual Derivatives	
45	EXTRA	Reading and Seminar - Choose from list	Quiz 7 - 3.1, 3.2
46	3.3	Product Rule and its Proof - Product Rule Practice	
47	3.6	Derivatives of sin(x) and cos(x) - Quotient Rule	
48	3.3	Product Rule - Quotient Rule	
49	3.5	Product Rule and Quotient Rule - Multiple derivatives	
50	EXTRA	Read an Original Text - L'Hopital, Leibniz, Cauchy, or something else	Quiz 8 - 3.3, 3.5
51	3.6	Trigonometric Derivatives - Tan(x), Sec(x), Etc.	
52	3.7	Chain Rule and its Proof	
53	3.7	Chain Rule and other Rules, Practice	
54	Review	Review Material	
55	Test 4	Test on Unit 4	Test 4

Unit 5 Derivative Techniques

Lesson #	Section	Topics	Assessments
56	3.9	Derivative of the Inverse	
57	3.9	Inverse Trig Derivatives	
58	3. 10	Practice Inverse, Start the Derivative of Exponential	
59	3. 10	Finalize derivative of exponential and defining e	
60	EXTRA	Math and Logic Puzzles	Quiz 9 - 3.9
61	3. 10	Derivative of a logarithm	
62	3. 10	Derivative of natural logs	
63	3. 10	Logarithmic Differentiation	
64	3. 10	Logarithmic Differentiation	
65	EXTRA	Introduce Parametric and Polar Equations	Quiz 10 - 3. 10
66	3.8	Implicit Functions	
67	3.8	Examples of Implicit Functions and History	
68	3.8	Practice Implicit	
69	3.8	Equations of Tangent Line	Quiz 11 - 3.8
70	3.8	Practice Implicit Derivatives and Tangent Lines	
71	Review	Review Material	
72	Test 5	Test on Unit 5	Test 5

Unit 6 Applications of Derivatives Part 1

Lesson #	Section	Topics	Assessments
73	3.11	Introduce Related Rates Word Problems	
74	3.11	Basic Geometric Problems (Rectangle, Circle, Box)	
75	3.11	Advanced Geometric Problems (Cone, Sphere, Triangle)	
76	3.11	Practice Geometric Related Rates Problems	
77	3.11	Trigonometric Related Rates Problems	
78	3.11	Other Related Rates Problems	
79	3.11	Additional Practice	
80	EXTRA	Applications of Related Rates to Other Fields (Chemistry, Physics, etc.)	Quiz 12 - 3.11
81	4.3	The Mean Value Theorem	

82	4.2/4.3	Critical Points and Extreme Values	
83	4.2	Identifying Minima/Maxima	
84	4.7	L'Hopitals Rule	
85	4.7	Multiple Uses	Quiz 13 - 4.2, 4.3
86	EXTRA	History, L'Hopital and Bernoulli	
87	Review	Review Material	
88	Test 6	Test on Unit 6	Test 6

Unit 7 Applications of Derivatives Part 2

Lesson #	Section	Topics	Assessments
89	Paper	Provide Examples of how to write a Math Essay, How to use Symbols on PC	
90	4.6	Introduction to Optimization	
91	4.6	Basic Optimization Problems (Maximizing Area of Rectangle, Minimize Perimeter)	
92	4.6	Volume and Surface Area Problems	
93	4.6	Speed and Time Problems	Quiz 14 - 4.6
94	4.6	Cost Problems	Rough Draft Due
95	4.6	Practice	
96	Paper	Paper Work Day	Quiz 15 - 4.6
97	Summation	How Summation Works and Notation	
98	Summation	Practicing Summation and Developing Basic Power Formulas	
99	4.9	Antiderivatives	
100	4.9	Patterns	
101	4.9	Formulas	
102	Paper	Paper Work Day	
103	Differential Eq.	Intro to Differential Equations	Quiz 16 - 4.9
104	Differential Eq.	Practice Basic Differential Equations	Final Draft Due
105	Review	Review Material	
106	Test 7	Test on Unit 7	Test 7

Unit 8 Areas under Curve and Integrals Part 1

Lesson #	Section	Topics	Assessments
107	5.1	Review Paper Results, Choose an Estimation Method (Probably Rectangles)	
108	5.1	Estimate Area using the Shape	
109	5.2	Make the formula for Area under a Curve more Accurate (Using Limits)	
110	5.2	Evaluate the Area using the Shape and Limits	Quiz 17 - 5.1
111	5.2	Practicing and Using the Summation Formulas	
112	EXTRA	Reading and Seminar - Choose from list	
113	5.3	The Fundamental Theorem of Calculus Part I	Quiz 18 - 5.2
114	5.3, 5.4	The FTC Part II	
115	5.3, 5.4	The FTC's Practice	
116	5.6	Substitution Method of Integrals	
117	5.6	Strategies for Choosing U	Quiz 19 - 5.3, 5.4
118	5.6	Definite Integrals	
119	5.6	Choosing u with Definite Integrals	
120	5.6	Practicing Substitution	
121	Review	Review Material	
122	Test 8	Test on Unit 8	Test 8

Unit 9 Areas under Curve and Integrals Part 2 (If Time Permits)

Lesson #	Section	Topics	Assessments
123	5.7	Introduction to Inverse Trigonometric Integrals	
124	5.7	Identifying and Practicing the Three Types	

125	5.7	Mixing Inverse Trigonometric Integrals and U-Substitution	
126	EXTRA	Watch Video about Differential Equations, 3Blue1Brown Intro Video is good	Quiz 20 - 5.7
127	5.8	Exponential Growth and Decay	
128	5.8	Using the Diff. Eq. and Identifying Doubling Time/Half Life	
129	5.8	Compound Interest	
130	EXTRA	Introduction to Biological Mathematics and Population Modelling	Quiz 21 - 5.8
131	6.1	Area between Curves Vertically (dx)	
132	6.1	Practicing Area Between Curves	
133	6.1	Area between Curves Horizontally (dy)	
134	6.1	Area between more than two curves	
135	6.1	Practice	
136	Review	Review Material	
137	Test 9	Test on Unit 9	Test 9