Unit 3: Sections 4.5 – 6.1 Skill Set

Section 4.5: Linear Approximations and Differentials

Assessment Item	Correlated MML Problems	Textbook
Find the linear approximation of a function at a given point.	7ab, 11ab, 37ab	9ab
Estimate a quantity using linear approximation or differentials.	7c, 11c, (15), 37c	9c, (14, 17)
Estimate percentage error in a calculation.	7d, 11d, 37d	9d
Find the linear approximation of a function near a given point.	15	14, 17
Approximate the change in function value when one independent variable changes by a relatively small amount.	23	24
Find the differential dy.	32	28, 29, 30, 31, 33

Additional Suggested Problems: 1, 2, 35, 39

Section 4.6: Mean Value Theorem

Assessment Item	Correlated MML Problems	Textbook
Determine if Rolle's Theorem applies to a function. If so, find the point(s) that are guaranteed to exist by Rolle's Theorem.	7, 9, 11	12
Determine if the Mean Value Theorem applies to a function. If so, find the points that are guaranteed to exist by the Mean Value Theorem.	15ab, 21ab	17ab, 22ab
Determine all points on the graph of a function at which the slope of the tangent line equals to the average rate of change over the given interval.	15c, 21c	17c, 22c, 27
Interpret a physical situation using the Mean Value Theorem.	29	30

Additional Suggested Problems: 1, 2, 3, 4, 5, 23, 31, 32

Section 4.7: L'Hopital's Rule

Assessment Item	Correlated MML Problems	Textbook
Evaluate limits involving indeterminate form: 0 / 0.	10, 13, 15, 19, 21	11, 16
Evaluate limits involving indeterminate form: ∞ / ∞.	23, 26	24
Evaluate limits involving indeterminate form: $0 \cdot \infty$.	27, 29	
Evaluate limits involving indeterminate form: $\infty - \infty$.	31, 33	

Additional Suggested Problems: 4, 5, 35, 36, 37, 42, 45, 47

Section 4.8: Antiderivatives

Assessment Item	Correlated MML Problems	Textbook
Find all the antiderivatives or the indefinite integral of a function.	13, 15, 17, 19, 21, 22, 29, 62	11, 61, 64, 67
Verify an indefinite integral formula by differentiation.	(11, 13, 15, 17, 19, 21, 22, 29, 62), 77	(11, 61, 64, 67), 76, 79
Solve an initial value problem.	31, 49	34, 35, 39, 51, 69
Solve an application involving motion with gravity.	56, 57	55, 58

Additional Suggested Problems: 2, 3, 5, 6, 59ad, 71, 73, 75

Section 5.1: Approximating Area under Curves

Assessment Item	Correlated MML Problems	Textbook
Given a positive velocity function, a table of velocities, or a graph of the velocity of an object on an interval, approximate the displacement using left, right, or midpoint Riemann sums.	9, 11	29, 59bc
Given a positive function, a table of function values, or a graph of a function on an interval, calculate left, right, and/or midpoint Riemann sums. (That is, approximate the area of the region bounded by the function and the x-axis on the given interval using Riemann sums.)	15, 19, 25, 27, 47	17, 21, 26, 37a, 55, 56
Express sums in sigma notation.	31abcd	
Use formulas for the sum of the first n integers, squares of integers, and/or cubes of integers to evaluate sums. (Calculator use is not required, nor recommended for these problems. However, you may use a calculator to check your work.)	(47)	34bdefg Method (i) only, (48, 49)

Additional Suggested Problems: 5, 6, 7, 8, 38, 43ab, 48, 49, 51, 68, 69

Section 5.2: Definite Integrals

Assessment Item	Correlated MML Problems	Textbook
Given a function or a graph of a function on an interval, calculate left, right, and/or midpoint Riemann sums. (That is, approximate the net area of the region bounded by the function and the x-axis on the given interval using Riemann sums.)	16	11
Use geometry to evaluate a definite integral.	27, 71	23, 25, 30, 72
Given a graph including areas of shaded regions, evaluate a definite integral.	33	31, 32, 34
Use properties of definite integrals to evaluate other integrals.	39, 41, 65	44
Use the definition of the definite integral with right Riemann sums to evaluate a definite integral. (Use formulas for the sum of the first n integers, squares of integers, and/or cubes of integers to evaluate sums.)	45, 48	46, 47
Given a function, use geometry to find the area and the net area of the region bounded by the function and the x-axis on a given interval.	66, 69	

Additional Suggested Problems: 1, 2, 3, 5, 7, 9, 42, 51ade, 75, 76

Section 5.3: Fundamental Theorem of Calculus

Assessment Item	Correlated MML Problems	Textbook
Given a graph including areas of shaded regions, evaluate an area function.	11abcde	
Given a function f, find and graph the area function A for f. Then, verify that d/dx[A(x)] = f(x).	13, 15	19
Evaluate a definite integral using The Fundamental Theorem of Calculus (FTC).	24, 25, 34, 74, 75	23, 26, 35, 37, 72
Find the net area and/or area of a region bounded by a given function and the x-axis.	40, 42	44, 45
Find dy/dx when y is a definite integral with exactly one of the limits of integration a function of x (using FTC and Chain Rule, if necessary).	49, 51, 85	50, 52, 54

Additional Suggested Problems: 4, 5, 8, 9, 78, 83, 87, 91

Section 5.4: Working with Integrals

Assessment Item	Correlated MML Problems	Textbook
Use symmetry to evaluate a definite integral.	14, 15	7, 8, 10, 16, 36
Find the average value of a function on the given interval.	19, 20	
Solve an application problem involving average value.	23, 25	
Find the point(s) at which the given function equals to its average value on the given interval. (That is, find the points that are guaranteed to exist by the Mean Value Theorem for Integrals.)	29	30

Additional Suggested Problems: 1, 2, 3, 21, 31, 41, 51, 52, 57

Section 5.5: Substitution Rule

Assessment Item	Correlated MML Problems	Textbook
Use the given substitution to find an indefinite integral.	13, 14	15
Use a change of variables (substitution) to find an indefinite integral.	17, 19, 20, 23, 29, 33, 52, 54	18, 24, 30
Use a change of variables (substitution) to evaluate a definite integral.	37, 61	36, 40, 43
Evaluate an integral (indefinite or definite) in which the function f is unspecified.		74, 75
Use two or more substitutions to find an integral.		86, 88

Additional Suggested Problems: 1, 3, 4, 5, 6, 39, 45, 49, 51abcd, 56, 65, 72, 79

Section 6.1: Velocity and Net Change

Assessment Item	Correlated MML Problems	Textbook
Given a velocity function, determine when motion is in the positive direction and when it is in the negative direction over the given interval.	8a, 11a, 13a	7a
Given a velocity function, find the displacement and the distance traveled over the given interval.	8bc	7bc
Given a velocity function, determine the position function.	11b, 13b	
Solve an initial value problem application.	15	16, 30
Find the position and velocity of an object given the acceleration, initial velocity, and initial position.		21, 22

Additional Suggested Problems: 2, 3, 4, 17, 19, 24, 29, 33, 41