Ch 7 Review: P 377 1-7 Odd, 11-17 odd, 25-31 odd, 35, 37, 39-42, 49, 51, 53, 55

Chapter 7 Comparison to the AP Calculus Curriculum

EU 2.3: The derivative has multiple interpretations and applications including those that involve instantaneous rates of change. (continued)	**LO 2.3D:** Solve problems involving rates of change in applied contexts.	**EK 2.3D1:** The derivative can be used to express information about rates of change in applied contexts.
	LO 2.3E: Verify solutions to differential equations.	**EK 2.3E1:** Solutions to differential equations are functions or families of functions.
		EK 2.3E2: Derivatives can be used to verify that a function is a solution to a given differential equation.
	LO 2.3F: Estimate solutions to differential equations.	**EK 2.3F1:** Slope fields provide visual clues to the behavior of solutions to first order differential equations.

2.3 D1

- Rates of change – The most common rate of change you will come across is speed or velocity. If you are confused with a given rate of change (for example the rate a volume increases over time), use an analogy to relate it to speed, distance and acceleration. Always be prepared to describe the units involved in a problem.

- The basics:
- Distance or position is often given by a function labeled as $s(t)$ or $x(t)$. Distance is the amount travelled without regard to direction, while position (or displacement) involves direction. Most often a negative displacement on the x-axis will involve movement to the left, but that depends on the situation described.

- Velocity is the rate of change with respect to time where positive and negative values reference the direction, while speed does not include direction.

- Acceleration describes the rate at which speed or velocity is changing.

- Velocity: $v(t) = \dfrac{dx}{dt}$, $v(t) = x'(t)$, or $v(t) = s'(t)$.

- Acceleration: $a(t) = \dfrac{d^2x}{dt^2}$, $a(t) = \dfrac{dv}{dt}$, $a(t) = x''(t)$, or $a(t) = v'(t)$.

- Displacement (change in position) = $\int_a^b v(t)dt = x(b) - x(a)$.

- Distance traveled = $\int_a^b |v(t)|dt$

2.3 E1

- If an initial condition is given, the solution to a differential equation will be one specific function. Otherwise it will be a general solution.
  - ex. The solution to the differential equation $\dfrac{dy}{dx} = 2x$ is the general solution $x^2 + C$ since an initial condition is not given.

2.3 E2

- You can use derivatives to verify the solution to a differential equation.

  - ex. Given that $y = x^3 - 5x$, verify if y is a solution to the following differential equations:

$2xy'' - 4y' - 20 = 0$ $\qquad\qquad$ $2x\dfrac{d^2y}{dx^2} - 4\dfrac{dy}{dx} + 20 = 0$

2.3 F1 – Be prepared to make a slope field, or match a given slope field to a differential equation. Usually it is easiest to look for values where the slope is zero or undefined and proceed from there.

3.3 B5

EU	LO	EK
EU 3.3: The Fundamental Theorem of Calculus, which has two distinct formulations, connects differentiation and integration.	**LO 3.3B(b):** Evaluate definite integrals.	**EK 3.3B5:** Techniques for finding antiderivatives include algebraic manipulation such as long division and completing the square, substitution of variables, (BC) integration

- Be able to integrate using substitution. Also, sometimes you might have to manipulate an equation before integrating.

ex. $\int_0^1 \frac{x^2+5x+6}{x+2}dx$ $\int_0^1 \frac{x+4}{x+2}dx$ $\int_0^1 \frac{3x^3+8x}{x^2+2}dx$

EU	LO	EK
EU 3.5: Antidifferentiation is an underlying concept involved in solving separable differential equations. Solving separable differential equations involves determining a function or relation given its rate of change.	**LO 3.5A:** Analyze differential equations to obtain general and specific solutions.	**EK 3.5A1:** Antidifferentiation can be used to find specific solutions to differential equations with given initial conditions, including applications to motion along a line, exponential growth and decay, (BC) and logistic growth.
		EK 3.5A2: Some differential equations can be solved by separation of variables.
		EK 3.5A3: Solutions to differential equations may be subject to domain restrictions.
		EK 3.5A4: The function F defined by $F(x)=c+\int_a^x f(t)dt$ is a general solution to the differential equation $\frac{dy}{dx}=f(x)$, and $F(x)=y_0+\int_a^x f(t)dt$ is a particular solution to the differential equation $\frac{dy}{dx}=f(x)$ satisfying $F(a)=y_0$.
	LO 3.5B: Interpret, create, and solve differential equations from problems in context.	**EK 3.5B1:** The model for exponential growth and decay that arises from the statement "The rate of change of a quantity is proportional to the size of the quantity" is $\frac{dy}{dt}=ky$.

3.5 A1 – do not worry about "logistic growth"