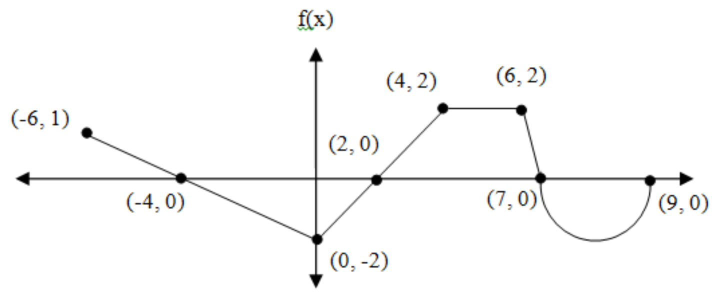
Alan Tupaj
Vista Murrieta High School
Website: www.vmhs.net
(Click on “Teachers” then “Alan Tupaj”)

Integration as Area
AP Readiness Session 6 - February

Answers to examples posted on my website

General Problem Steps	**Examples**
Given the graph of a function, find the area under the function over a given interval. (same as the definite integral of the function over the interval) (must be linear or circular to use geometry) • Divide up the given interval into geometric shapes • Area below the x-axis is considered negative • If limits of integration are left to right (low to high), then each area changes sign • If evaluating a function defined as the integral of the given function from x to a, then you must add the initial condition given at F(a)	 1. Find $\int_0^2 f(x)dx$ = 2. Find $\int_0^9 f(x)dx$ = 3. Find $\int_2^{-6} f(x)dx$ = 4. Find $\int_8^6 f(x)dx$ = Given the graph of $f'(x)$ and $f(0) = 3$ 5. Find $f(-6)$ = 6. Find $f(6)$ =
Given a function, find the area under the graph over a given interval • Evaluate the definite integral of the function over the interval.	7. Find the area under the curve $f(x) = -x^2 + 6x - 3$ on the interval (1, 2).
Given a region defined by two functions, $f(x)$ and $g(x)$, find the area of the region. • If $f(x) \geq g(x)$, then Area = $\int_a^b (f(x) - g(x))dx$ • If the interval from *b* to *a* is not given, then *b* and *a* are the points of intersection of $f(x)$ and $g(x)$ • Find points of intersection by setting $f(x)$ = $g(x)$ and solving for x	8. Find the area enclosed by $f(x) = 5 - x^2$ and $g(x) = x - 7$

Given a region defined by two functions, $f(x)$ and $g(x)$, with more than two points of intersection, find the area of the region. • Find points of intersection by setting $f(x) = g(x)$ and solving for x • Determine which function is greater over each interval • Split into two integrals A = $\int_c^b (f(x)-g(x))dx + \int_a^c (g(x)-f(x))dx$ Where *a*, *b*, and *c* are points of intersection, *c* is between *a* and *b*, $f(x) \geq g(x)$ between *b* and *c*, and $g(x) \geq f(x)$ between *c* and *a*	9. Find but do not evaluate an integral to represent the area enclosed by $f(x) = x^3 - 2x^2$ and $g(x) = 2x^2 - 3x$
Given a region defined by two relations where x = some expression of y, the area can be determined by an integral in the y-direction. Area = $\int_c^d (f(y)-g(y))dy$ Where c and d are the y-coordinates of the points of intersection and $f(y) \geq g(y)$ (graph of $f(y)$ is to the right of $g(y)$)	10. Find but do not evaluate an integral to represent the area enclosed by the graphs of $x = 3 - y^2$ and $x = y + 1$
Given a region defined by multiple boundaries, find the area. • Determine all intersecting points of the boundaries of the region • If necessary, split the region into multiple integrals	11. Find but do not evaluate an integral to represent the area enclosed by: $y = 2\sqrt{x-1} - 3$, $y = -2x + 11$,and the x-axis