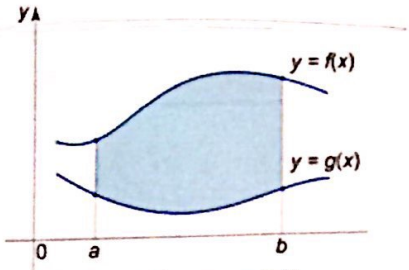
AP Calculus BC: Basic Concepts from AB Practice

note that your quiz can have ANY of the concepts from AB, NOT just what you see here as examples

1. Given the following graph, please indicate the area formula needed to calculate the area of the shaded region:

$$\int_a^b F(x) - g(x)\,dx$$



2. What equation would you use to calculate the volume if the region in #1 is rotated about the x-axis?

Washer $\quad \pi \int_a^b (F(x))^2 - (g(x))^2\,dx$

3. What equation would you use to calculate the volume if the region in #1 is rotated about the line y = 6?

$$V = \pi \int_a^b (6 - g(x))^2 - (6 - F(x))^2\,dx$$

4. What equation would you use to calculate the volume of a solid with the base as area in region in #1 if cross-sections cut perpendicular to x-axis were semicircles?

$$V = \tfrac{1}{2}\pi \int_a^b \left(\frac{F(x) - g(x)}{2}\right)^2$$

5. The height of an object at time t is s(t). Give the formula used to determine the average velocity on interval [1, 8].

$$\frac{s(8) - s(1)}{8 - 1}$$

6. Given the volume V(x) determine the formula used to determine the average volume on interval [1, 4].

$$\frac{1}{4-1}\int_1^4 V(x)\,dx$$

7. Given position x(t), how would you use calculus to determine when the object is moving left?

$\frac{d}{dx}[x(t)]$ $\qquad x'(t) < 0$

8. Given position = x(t), velocity = v(t), and acceleration = a(t), give the formula to determine the total distance traveled on time interval [a, b].

$$\int_a^b |v(t)|\,dt$$

9. Given velocity = v(t) and object is at 4 m at t = 3, give the formula used to determine position at t=0.

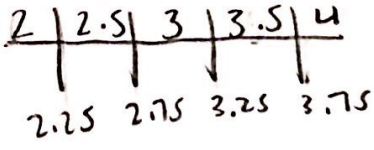
$\int_0^3 v(t)\,dt = s(3) - s(0)$ $\qquad s(0) = \int$

$s(0) = s(3) - \int_0^3 v(t)\,dt$

10. Given velocity = v(t), give the formula to determine displacement [a, b].

$\int_a^b v(t)\,dt$

11. Give the general formula used to do the Midpoint Riemann Sum to approximate $\int_2^4 f(x)dx$ using 4 equal subintervals.



$\Delta x = \frac{1}{2}$

$\frac{1}{2}f(2.25) + \frac{1}{2}f(2.75) + \frac{1}{2}f(3.25) + \frac{1}{2}f(3.75)$

12. Give the general formula used to do the Trapezoidal Sum to approximate $\int_2^4 f(x)dx$ using 4 equal subintervals.

$\frac{1}{2}\cdot\frac{1}{2}(b_1+b_2) + \frac{1}{2}(b_2+b_3) + \frac{1}{2}(b_3+b_4)$

$\frac{1}{2}\Delta x\left[f_1+f_2\right] \Rightarrow \frac{1}{2}\cdot\frac{1}{2}\left(f(2)+f(2.5)\right) + \frac{1}{2}\cdot\frac{1}{2}\left(f(2.5)+f(3)\right) + \frac{1}{2}\cdot\frac{1}{2}\left(f(3)+f(3.5)\right) + \frac{1}{2}\cdot\frac{1}{2}\left(f(3.5)+f\right)$

(250-P)

13. Given $\frac{dP}{dt} = 0.02P(500-2P)$ is a logistic differential equation where P is the number of gorillas in a nature preserve, determine (include units):

$\lim_{t\to\infty} P(t) =$ M → 250 gorilla Max growth rate occurs at P = $\frac{M}{2}$ → 125 gorillas

14. Explain HOW you would use calculus to determine the ABSOLUTE minimum for f(x) on [a, b].

Find CN → Plug in CN + endpts into f(x)
Smallest value = Abs min

15. State the Mean Value Theorem.

$F'(c) = \frac{F(b)-F(a)}{b-a}$ MVT if continuous on [a,b] and differentiable on (a,b) then there exists at least one c in (a,b) where

16. Evaluate $\lim_{h\to 0} \frac{\sec(x+h)-\sec x}{h}$

$\sec x \tan x$

17. Give the formula to find the length of f(x) on [2, 6].

$\int_2^6 \sqrt{1+(F'(x))^2}\,dx$ $\Big\{$ $\int_a^b \sqrt{1+(F'(x))^2}\,dx$