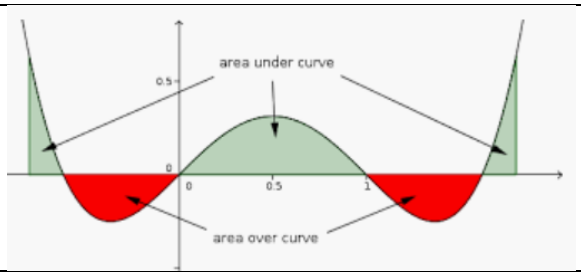
BC Calculus Name_____Pd.___

Application of Integration: Review Date_____Seat #___

Please start off every review with reading your notecards for that unit several times!!!!! This is a very limited review!!!!

Integration-finding the area bounded between a function & the x-axis. Area above the x-axis is and area below the x-axis is .	

$\int rate =$ $\int \frac{miles}{hour} =$ $\int \frac{gallon}{\min} =$ $\int \frac{\text{lbs of banannas}}{hour}$

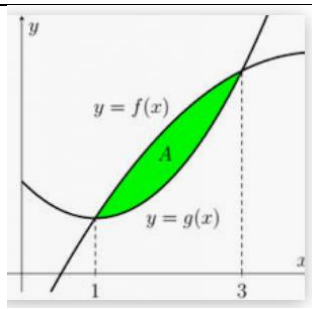
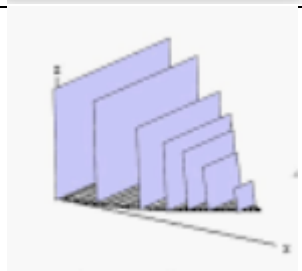
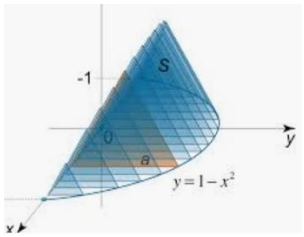
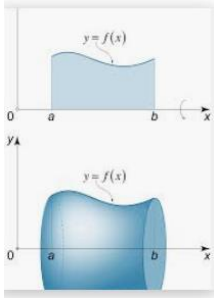
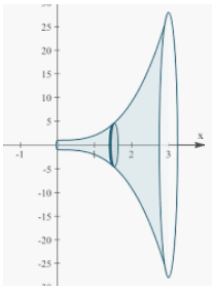
Average Value- $\frac{1}{hr_2 - hr_1}\int_{hr_1}^{hr_2} \frac{miles}{hour}$

Estimating Area-Right endpoint, left endpoint, midpoint & Trapezoidal approximation. We practiced from a graph, function, & table

Right-area rectangle	Left-area rectangle	Mid=area rectangle	Trap=area trapezoid
$A = width \bullet length(f(x))$	$A = width \bullet length(f(x))$	$A = width \bullet length(f(x))$	$A = \frac{height}{2}(b_1 + b_2)$

Fundamental Theorem of Calculus- $\frac{d}{dx}\int_{\#}^{x} f(t)dt = f(x)$ *and* $\frac{d}{dx}\int_{\#}^{AT} f(t)dt = f(AT) \bullet AT'$

- **Area & Volume are never negative**

Area- $\int_{x_1}^{x_2}$ top function-bottom function dx *or* $\int_{y_1}^{y_2}$ right function-left function dx You chose dx or dy	
Volume(cross sections perpendicular to)- $\perp$ –to $x-axis = \int_{x_1}^{x_2}$ area of cross section $\perp$ –to $y-axis = \int_{y_1}^{y_2}$ area of cross section You have no choice $\perp(x) = dx$ & $\perp(y) = dy$	 
Volume-rotated about axis (solid hunka hunka) rotated about $x-axis = \pi\int_{x_1}^{x_2} R^2 dx$ (cross sections ○'s) or paralle to x (y=#) rotated about $y-axis = \pi\int_{y_1}^{y_2} R^2 dx$ or paralle to y (x=#) You have no choice x or ‖ to x=dx or y or to ‖ y=dy	 

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Volume-rotated about axis (hole)

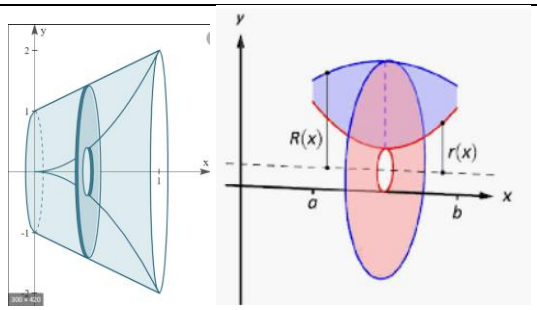
rotated about $x-axis = \pi\int_{x_1}^{x_2} R^2 - r^2\,dx$

or paralle to x (y=#)

rotated about $y-axis = \pi\int_{y_1}^{y_2} R^2 - r^2\,dy$

or paralle to y (x=#)

You have no choice x or || to x=dx or y or to || y=dy



Practice:

1. $\int_{-4}^{4} f(x)dx =$

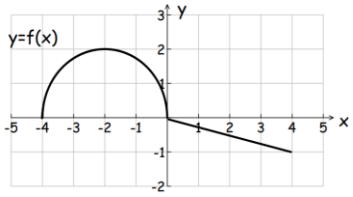
a.) $2\pi+1$

b.) $2(\pi-1)$

c.) $\pi+2$

d.) $2(2\pi+1)$

e.) $\pi+1$



2. What is the average value of the function $g(x)=(2x+3)^2$ on the interval $(-3,-1)$?

a.) $\frac{7}{3}$

b.) -4

c.) 5

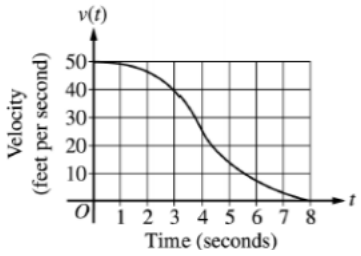
d.) $\frac{14}{3}$

e.) 3

3. The graph gives the velocity, v in ft/sec, of a car for $0\le t\le 8$, where t is the time in seconds. Of the following, which is the best estimate of the distance traveled by the car from $t=0$ until the car comes to a complete stop?

a.) 21 *ft* b.) 26 *ft* c.) 180 *ft*

d.) 210 *ft* e.) 260 *ft*



4. The graph of the function f is shown for $0\le x\le 3$. Of the following, which has the smallest value?

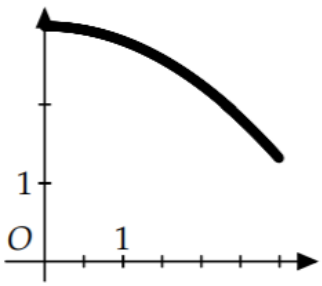
a.) $\int_1^3 f(x)dx$

b.) Left Riemann sum approximation of $\int_1^3 f(x)dx$ of equal length.

c.) Right Riemann sum approximation of $\int_1^3 f(x)dx$ of equal length.

d.) Midpoint Riemann sum approximation of $\int_1^3 f(x)dx$ of equal length.

e.) Trapezoidal sum approximation of $\int_1^3 f(x)dx$ of equal length.



5. $\frac{d}{dx}\int_2^x \sqrt{1+t^2}\,dt =$

a.) $\frac{x}{\sqrt{1+x^2}}$ b.) $\sqrt{1+x^2}-5$ c.) $\sqrt{1+x^2}$

d.) $\frac{x}{\sqrt{1+x^2}}-\frac{1}{\sqrt{5}}$ e.) $\frac{x}{2\sqrt{1+x^2}}-\frac{1}{2\sqrt{5}}$

6. $F(x)=\int_1^{x^2}\sqrt{1+t^3}\,dt$, then $F'(x)=$

a.) $2x\sqrt{1+x^6}$

b.) $2x\sqrt{1+x^3}$

c.) $\sqrt{1+x^6}$

d.) $\sqrt{1+x^3}$

Key: 1-B 2-A 3-D 4-C 5-C 6-A 7-A 8-B 9-B 10-C 11-E 12-D 13-C 14-E 15-C 16-B 17-D 18-A

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7. **Non-Calculator** What is the area of the region in the first quadrant bounded by the graph of $y = e^{\frac{x}{2}}$ and the line $x = 2$?

a.) $2e - 2$
b.) $2e$
c.) $\frac{e}{2} - 1$
d.) $\frac{e-1}{2}$
e.) $e - 1$

8. **Calculator** What is the area enclosed by the curves $y = x^3 - 8x^2 + 18x - 5$ and $y = x + 5$?

a.) 10.667
b.) 11.833
c.) 14.583
d.) 21.333
e.) 32

9. **Calculator** Let R be the region in the first and second quadrants bounded above by the graph of $y = \frac{20}{1+x^2}$ and below by the horizontal line $y = 2$. R is the base of a solid whose cross sections perpendicular to the x-axis are semicircles. What is the volume of the solid?

a.) 29.815
b.) 174.268
c.) 348.537
d.) 443.771

10. **Non-Calculator** Let r be the region in the first quadrant bounded above by the graph of $y = \sqrt{x}$ and below by the graph of $y = x^2$. R is the base of a solid whose cross sections perpendicular to the y-axis are squares. Which of the following gives the volume to the solid?

a.) $\int_0^1 \left(\sqrt{x} - x^2\right)^2 dx$
b.) $\int_0^1 \left(x - x^4\right)^2 dx$
c.) $\int_0^1 \left(\sqrt{y} - y^2\right)^2 dy$
d.) $\int_0^1 \left(\sqrt{y} - y^2\right) dy$

11. **Non-Calculator** Which integral below gives the volume of the solid of revolution obtained by rotating the bounded region between $y = \sqrt{x}$ and $y = x^2$ about the line $y = 3$?

a.) $\pi\int_0^1 (9 - x) - \left(9 - x^4\right)$
b.) $\int_0^1 \left(3 - \sqrt{x}\right)^2 - \left(3 - x^2\right)^2$
c.) $\pi\int_0^1 \left(3 - \sqrt{x}\right)^2 - \left(3 - x^2\right)^2$
d.) $\int_0^1 \left(3 - x^2\right)^2 - \left(3 - \sqrt{x}\right)^2$
e.) $\pi\int_0^1 \left(3 - x^2\right)^2 - \left(3 - \sqrt{x}\right)^2$

12. **Non-Calculator** Find the volume of the solid of revolution obtained by rotating the region in the xy-plane bounded by $y = x^3 + 1$, $x = 1$, and $y = 1$ about the y-axis.

a.) $\frac{11\pi}{3}$
b.) $\frac{4\pi}{13}$
c.) $\frac{3\pi}{7}$
d.) $\frac{2\pi}{5}$
e.) $\frac{2\pi}{9}$

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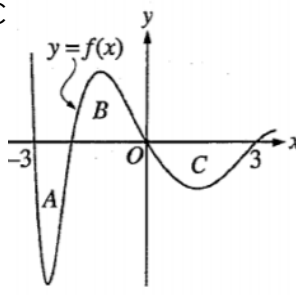
13. Calculator What is the average value of $y = \dfrac{\cos x}{x^2 + x + 2}$ on the closed interval $[-1,3]$?

a.) –0.085
b.) 0.090
c.) 0.183
d.) 0.244
e.) 0.732

14. $\dfrac{d}{dx}\int_0^{x^2} \sin(t^3)dt =$

a.) $-\cos(x^6)$
b.) $\sin(x^3)$
c.) $\sin(x^6)$
d.) $2x\sin(x^3)$
e.) $2x\sin(x^6)$

15. **N.C.** The regions A, B, & C in the figure are bounded by the graph of the function f and the x-axis. If the area of each region is 2, what is the value of $\int_{-3}^{3}(f(x)+1)dx$?



a.) –2
b.) –1
c.) 4
d.) 7
e.) 12

16. **Calculator** The base of a solid is the region in the first quadrant bounded by the y-axis, the graph of $y = \tan^{-1}(x)$, the horizontal line $y = 3$, and the vertical line $x = 1$. For the solid, each cross section perpendicular to the x-axis is a square. What is the volume of the solid?

a.) 2.561
b.) 6.612
c.) 8.046
d.) 8.755
e.) 20.773

17. **Non-Calculator** What is the area of the region between the graphs of $y = x^2$ & $y = -x$ from $x = 0$ to $x = 2$?

a.) $\dfrac{2}{3}$
b.) $\dfrac{8}{3}$
c.) 4
d.) $\dfrac{14}{3}$
e.) $\dfrac{16}{3}$

18. **Non-Calculator** If the region enclosed by the y-axis, the line $y = 2$, and the curve $y = \sqrt{x}$ is revolved about the y-axis, the volume of the solid generated is

a.) $\dfrac{32\pi}{5}$
b.) $\dfrac{16\pi}{3}$
c.) $\dfrac{16\pi}{5}$
d.) $\dfrac{8\pi}{3}$
e.) π