AP Calculus

Pretest Riemann Sums Basic Integration

Name _____ Date _____

1. Use a Riemann sum to approximate the area under the curve, and above the x-axis, for $y = x^3$ from $x = 2$ to $x = 5$ using 6 sub-intervals and *right* endpoints. Answer to 3 decimal places.

   a) 162.340 b) 152.250 c) 182.813

   d) 183.452 e) 174.250

2. Use a Riemann sum to approximate the area under the curve, and above the x-axis, for the curve $y = \ln x$ from $x = 2$ to $x = 4$. Use 4 sub-intervals and *left* endpoints. Answer to 3 decimal places.

   a) 1.781 b) 2.185 c) 2.356

   d) 1.980 e) 2.674

3. The following table shows selected coordinates for $y = f(x)$:

x	1	2	3	4	5
y	.8	2.0	5.2	11.4	16.8

   Given that f is continuous on $[1, 5]$, find a trapezoidal approximation, with $n = 4$, for the area under the curve from $x = 1$ to $x = 5$.

4. Use geometric properties to evaluate $\int_2^7 |x - 4|\, dx$.

   a) 0 b) $\frac{9}{2}$ c) $\frac{13}{2}$ d) 6 e) 7

5. Use a calculator to determine $\int_1^3 3e^{-2x^2}\, dx$.

   a) 1.587 b) 1.038 c) 0.017

   d) 0.109 e) 0.086

6. If $f(t) = \int_{3t}^2 (\sqrt{x} + x)\, dx$, then $f'(t) =$ _____.

   a) $3(\sqrt{3t} + 3t)$ b) $-3(\sqrt{3t} + 3t)$

   c) $3(\sqrt{t} + t)$ d) $\sqrt{t} + t$

   e) $-3(\sqrt{t} + t)$

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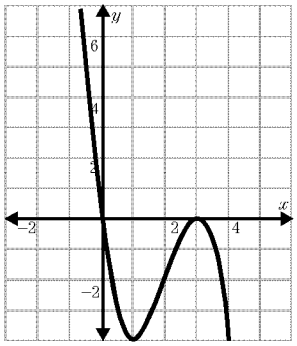
7. Given the graph of f':



From the graph it follows that

a) f has a min at $x = 1$

b) f has a max at $x = 1$

c) f has a min at $x = 0$

d) f has a max at $x = 0$

e) f has a max at $x = 2$

8. Use the Fundamental Theorem of Calculus to evaluate $\int_1^9 \sqrt{x}\,dx$.

a) 1 b) $-\frac{17}{3}$ c) 7 d) $\frac{52}{3}$ e) -1

9. Given the function $f(x) = 3x^2 - 2$, find its average value on the interval $[0, 2]$.

a) 1 b) 2 c) 5 d) 4 e) 6

10. Find the average value of $4x$ over the interval $a \le x \le b$.

a) $b^2 - a^2$ b) $a^2 - b^2$ c) $2b^2 - a^2$

d) $b - a$ e) $2(b + a)$

11. Given $g(x) = 2A + 3h(x)$ and $\int_1^4 h(x)\,dx = 4A$, find the average value of $g(x)$ over the interval $[1, 4]$ in terms of A.

a) $\frac{A}{3}$ b) $\frac{5A}{4}$ c) $\frac{10A}{3}$

d) $6A$ e) $12A$

12. Find the average value of

$$f(x) = \begin{cases} x + 7 & \text{for } -7 \le x < 0, \\ -3x + 9 & \text{for } 0 \le x \le 3 \end{cases}$$

on $[-7, 3]$.

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13. A roadrunner moves in a straight line at any time t with velocity $v(t) = 2e^t$. How far does it move from $t = 0$ to $t = 3$?

a) $2e^3 - 1$ b) $2(e^3 - 1)$ c) $e^3 - 2$

d) $2 \ln e + e$ e) $e^2 - 2$

14. The horizontal location of a ball bouncing off a wall has a velocity $v(t) = 6t - 3t^2$.

a) How far does it travel in the first 2 seconds?

b) What is the *total* distance traveled by the object in the first 3 seconds?

15.

t (hours)	$R(t)$ (gallons/hr)
0	8.2
3	9.6
6	10.0
9	10.8
12	11.2
15	10.9
18	10.3
21	9.4
24	8.2

The rate at which water flows out of a pipe, in gallons per hour, is given by a differentiable function R of time t. The table shows the rate as measured every 3 hours for a 24-hour period.

a) Use a midpoint Riemann sum with 5 subdivisions of equal length to approximate $\int_0^{24} R(t)\,dt$. Using correct units, explain the meaning of your answer in terms of water flow.

b) Is there some time t, $0 < t < 24$ such that $R'(t) = 0$? Justify your answer.

c) The rate of water flow, $R(t)$, can be approximated by $Q(t) = \frac{1}{94}(770 + 24t - t^2)$. Use $Q(t)$ to approximate the average rate of water flow during the 24-hour period. Indicate units of measure.

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1.
Answer: c
CodePath: EAS.APC.F.A.7

2.
Answer: d
CodePath: EAS.APC.F.A.10

3.
Answer: 27.4
CodePath: EAS.APC.F.B.25

4.
Answer: c
CodePath: EAS.APC.F.D.61

5.
Answer: e
CodePath: EAS.APC.F.H.32

6.
Answer: b
CodePath: EAS.APC.F.I.27

7.
Answer: d
CodePath: EAS.APC.F.J.36

8.
Answer: d
CodePath: EAS.APC.F.D.34

9.
Answer: b
CodePath: EAS.APC.G.A.4

10.
Answer: e
CodePath: EAS.APC.G.A.10

11.
Answer: d
CodePath: EAS.APC.G.A.21

12.
Answer: 3.8
CodePath: EAS.APC.G.A.34

13.
Answer: b
CodePath: EAS.APC.G.C.39

14.
Answer: 4, 8
CodePath: EAS.APC.G.C.43

15.
Answer: 122.1 gallons, yes since $R(0) = R(24)$, 9.213 gal/hr
CodePath: EAS.APC.H.A.46