Problem Set 1 Unit 1 Spring AB 2017

Name: ______________________ **Date:** ______________

1. Find the average value of x^3 over the interval $a \le x \le b$.

   A. $(b^2 - a^2)(b^2 + a^2)$ B. $\dfrac{(b^2 + a^2)(b + a)}{4}$

   C. $\dfrac{b^2 + a^2}{4}$ D. $b - a$

2. $\dfrac{d}{dx} \displaystyle\int_1^{\sin x} (1 + t^2)\,dt =$

   A. $(1 + 2\sin x)\cos x$ B. $(1 + t^2)\cos x$

   C. $(1 + \sin^2 x)\cos x$ D. $(1 + \sin^2 t)\cos t$

3. If $F(x) = \displaystyle\int_1^{x^3 - 10} f(t)\,dt$ and $f(-2) = 5$, then $F'(2) =$

   A. 60 B. 30 C. 10 D. -10

4. Use the properties of integrals to find $\displaystyle\int_a^b (f(x) + 4)\,dx$, if $\displaystyle\int_a^b f(x) = 5A - 3B$.

   A. $A + B$ B. $A - 7B$

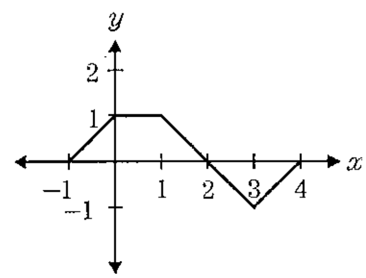
   C. $5A - 3B$ D. $5A - 3B + 4$

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

x	1	2	3	4
y	2.6	3.4	5.8	10.2

   Given that f is continuous on $[1, 4]$, find a trapezoidal approximation, with $n = 3$, for the area under the curve from $x = 1$ to $x = 4$.

6. The graph of f is shown for $-1 \le x \le 4$. What is the value of $\displaystyle\int_{-1}^{4} f(x)\,dx$?



   A. 1 B. 2 C. 4 D. 0

7. Use the properties of integrals to determine the value of $\displaystyle\int_1^6 (f + g)(x)\,dx$, if $\displaystyle\int_1^6 f(x)\,dx = 9$ and $\displaystyle\int_1^6 g(x)\,dx = -5$.

   A. 14 B. 4 C. -4 D. 7

8. If there are 6 intervals, estimate $\int_1^4 \frac{1}{x}\,dx$ by using the Trapezoidal Rule.

A. 1.234 B. 1.405 C. 1.491 D. 1.836

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

x	1	2	3	4	5
y	1.2	3.8	6.4	15.2	26.2

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 $x = 5$.

10. If $\int_0^a x^5\,dx = k$ for $a > 0$ then, in terms of k, $2\int_0^a x^5\,dx =$ ________

A. $k - 2$ B. $k + 2$ C. k^2 D. $2k$

11. If $F'(x) = f(x)$ for all x, and if f is a continuous function, then $\int_2^7 f(3x)\,dx =$

A. $\frac{1}{3}(F(7) - F(2))$ B. $\frac{1}{3}(F(21) - F(6))$

C. $F(21) - F(6)$ D. $3(F(21) - F(6))$

12. Find an expression in a and b for the value of the definite integral:

$$\int_a^b \left[9x^2 + \sqrt{x-8}\,\right] dx.$$

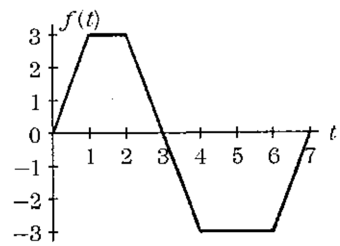
A. $3(a^3 - b^3) + \frac{2}{3}(a-8)^{3/2} - \frac{2}{3}(b-8)^{3/2}$

B. $3(b^3 - a^3) + \frac{2}{3}(b-8)^{3/2} - \frac{2}{3}(a-8)^{3/2}$

C. $9(a^2 - b^2) + \sqrt{a-8} - \sqrt{b-8}$

D. $3(b^3 - a^3) + (b-8)^{3/2} - (a-8)^{3/2}$

13.



The graph of $f(t)$ is shown. Fill in the table for $F(x) = \int_0^x f(t)\,dt$.

x	0	1	2	3	6	7
$F(x)$						

14. Given $\int_{-2}^{7} f(x)\,dx = 10$ and $\int_{-2}^{0} f(x)\,dx = -3$.

Evaluate:

a) $\int_0^7 f(x)\,dx$

b) $\int_2^{11} f(x-4)\,dx$

15. Use a Trapezoidal approximation for $\int_1^3 \sqrt{x}\,dx$ with $n = 6$.

A. 3.048 B. 3.142 C. 2.915 D. 2.795

16. On the remote island Principia the population of a newly discovered bacteria in the year 1990 was about 5 billion. If the population was growing according to $P(t) = 5e^{0.017t}$, then which definite integral gives the population for the 8-year period starting from the year 1990. Assume $t = 0$ at the beginning of the year 1990.

A. $\int_0^8 5e^{0.017t}\,dt$ B. $\int_0^1 40e^{0.017t}\,dt$

C. $\int_{1990}^{1998} 5e^{0.017t}\,dt$ D. $\int_0^{1998} 5e^{0.017t}\,dt$

17. Use the Trapezoidal Rule to approximate the area of the region under the graph of $f(x) = (1 + x^2)^{1/2}$ for $n = 6$ and $0 \leq x \leq 3$.

A. 4.570 B. 5.563 C. 5.672 D. 6.661

18. Use the Trapezoidal Rule to estimate the definite integral. [Use $n = 4$.]

$$\int_2^6 (x^2 + 6x + 5)\,dx.$$

A. 372 B. 186 C. 132 D. 220

19. $\frac{d}{dx}\int_{x^6}^{1} \frac{dt}{2t-5} =$

A. $\frac{1}{2x-5}$ B. $\frac{6x^5}{2x-5}$

C. $-\frac{6x^5}{2x^6-5}$ D. $\frac{x^6}{2x^6-5}$

20. $\frac{d}{dx}\int_{x}^{4} \frac{2t}{t^3+4}\,dt =$

A. $\frac{2t}{t^3+4}$ B. $-\frac{2t}{t^3+4}$

C. $-\frac{2x}{x^3+4}$ D. $\frac{2}{17}$