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QUESTION 1

(1 pts)

Express the limit,  $\lim_{n \rightarrow \infty} \sum_{i=1}^n \frac{2}{n} (1 + \frac{2i}{n}) \sqrt{1 + \frac{2i}{n}}$ , as a definite integral.

A.  $\int_1^3 x \sqrt{x} \, dx$

C.  $\int_1^3 (x \sqrt{x}) \frac{2}{n} \, dx$

B.  $\int_1^3 \sqrt{x} \, dx$

D.  $\int_1^n x \sqrt{x} \, dx$

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QUESTION 2

(1 pts)

Suppose  $\int_1^2 x^2 \, dx$ . Using this information, what are absolute minimum and maximum of the integrand  $f(x) = x^2$ ? (Write as an inequality).

A.  $1 \leq x \leq 2$

C.  $1 \leq x^2 \leq 2$

B.  $1 \leq x^2 \leq 4$

D.  $1 \leq x \leq 4$

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QUESTION 3

(1 pts)

Suppose you want to estimate  $\int_1^4 f(x) \, dx$ , with 3 rectangles. What are the midpoints of the subintervals?

A.  $x_1 = 2, x_2 = 3, x_3 = 4$

C.  $x_1 = \frac{3}{2}, x_2 = \frac{5}{2}, x_3 = \frac{7}{2}$

B.  $x_1 = \frac{1}{2}, x_2 = \frac{3}{2}, x_3 = \frac{5}{2}$

D.  $x_1 = 1, x_2 = 2, x_3 = 3$

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QUESTION 4

(1 pts)

Which of the following defines a definite integral?

A. An antiderivative that produces a function with an arbitrary constant  $C$ .

C. The derivative of the area function.

B. The limit as  $f(x)$  goes to infinity.

D. An integral which is evaluated over a specific interval, and produces a constant value.

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QUESTION 5

(1 pts)

The fundamental theorem of calculus (part 1) says: If  $f$  is continuous on  $[a, b]$ , then the function  $g$  defined by  $g(x) = \int_a^x f(t) \, dt$ ,  $a \leq x \leq b$ , is continuous on  $[a, b]$  and differentiable on  $(a, b)$ , and  $g'(x) = f(x)$ . What does this mean in words?

A.  $g'(x)$  exists on  $[a, x]$ .

C. The derivative of  $f(x)$  is equal to  $F(b) - F(a)$ .

B. The derivative of the area function is equal to the integrand.

D.  $g(x)$  is only differentiable when  $f(t)$  exists on  $[a, b]$ .

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QUESTION 6

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(1 pts)

The fundamental theorem of calculus (part 2) says: If  $f(x)$  is continuous on  $[a, b]$ , then  $\int_a^b f(x) dx = F(b) - F(a)$ , where  $F(x)$  is any antiderivative of  $f(x)$ . What does this mean in words?

- A. If  $F(x)$  is the anti-derivative of  $f(x)$ , then  $\int_a^b f(x) dx$  is equal to  $F(x)$  evaluated at  $b$ , subtracted by  $F(x)$  evaluated at  $a$ .
- B. The derivative of  $f(x)$  is equal to  $F(b) - F(a)$ .
- C. The derivative of the area function is equal to the integrand.
- D. The derivative of  $f(x)$  is equal to  $F(x)$  evaluated at  $b$ , subtracted by the  $F(x)$  evaluated at  $a$ .

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QUESTION 7

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(1 pts)

Suppose you have  $\int_{-1}^2 x^2 dx$  and  $F(x) + C$  is the antiderivative of  $f(x)$ , where  $C = 0$ . Using the same notation as the Fundamental Theorem of Calculus, what is  $F(b)$  and  $F(a)$ ?

- |                                                                 |                                                                 |
|-----------------------------------------------------------------|-----------------------------------------------------------------|
| A. $F(b) = F(-1) = \frac{-1}{3}$<br>$F(a) = F(2) = \frac{8}{3}$ | C. $F(b) = F(2) = \frac{8}{3}$<br>$F(a) = F(-1) = \frac{-1}{3}$ |
| B. $F(b) = F(2) = \frac{4}{3}$<br>$F(a) = F(-1) = \frac{-1}{3}$ | D. $F(b) = F(2) = \frac{8}{3}$<br>$F(a) = F(-1) = \frac{1}{3}$  |

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QUESTION 8

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(1 pts)

Which of the below is equivalent to  $\int_1^2 x^3 + 2x + 3 dx$ ?

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|-----------------------------------------|-----------------------------------------------------------|
| A. $\frac{39}{4}$                       | C. $(\frac{2^4}{4} + 2^2 + 3(2)) - (\frac{1}{4} + 1 + 3)$ |
| B. $\frac{x^4}{4} + x^2 + 3x \Big _1^2$ | D. A, B, and C.                                           |

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QUESTION 9

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(1 pts)

Evaluate  $\int_2^2 \sqrt{x} dx$ .

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|------------------------|--------------------------|
| A. 0                   | C. Does not exist.       |
| B. $\frac{2^{5/2}}{3}$ | D. $\frac{2^{5/2}-2}{3}$ |

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QUESTION 10

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(1 pts)

Evaluate  $\int_{-1}^2 \frac{1}{x^3} dx$ .

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|-------------------|-------------------|
| A. $\frac{3}{8}$  | C. 0              |
| B. Does not exist | D. $\frac{-3}{8}$ |