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Find the absolute maximum value of  $y = x^3 - 6x^2 + 9x - 2$  on the interval  $[0, 5]$ .

- A. 2
- B. 18
- C. 6
- D. 10
- E. 14

Correct Answers:

- B

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Where is the function  $f(x) = e^{-x}(2x - 3)$  decreasing?

- A.  $(-\infty, 1.5]$
- B.  $[2.5, \infty)$
- C.  $(-\infty, \infty)$
- D.  $(-\infty, 2.5]$
- E.  $[1.5, \infty)$

Correct Answers:

- B

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Where does the function  $f(x) = x^3 - 3x^2$  have a point of inflection?

- A.  $x = 1$
- B.  $x = 2$
- C.  $x = -4$
- D.  $x = 3$
- E.  $x = 0$

Correct Answers:

- A

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Find the number  $c$  that satisfies the conclusion of the Mean Value Theorem for  $f(x) = 2\sqrt{x}$  on the interval  $[0, 25]$ .

- A.  $c = 0$
- B.  $c = 25/4$
- C.  $c = 5$
- D.  $c = 1/5$
- E. None of the above

Correct Answers:

- B

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The function  $f(x) = x^2 - 6x + 13$  satisfies the hypotheses of Rolle's Theorem on the interval  $[0, 6]$ . Find all values of  $c$  that satisfy the conclusion of the theorem.

- A.  $c = 2$  and  $c = 3$
- B.  $c = 3$  only
- C.  $c = 2$  only
- D.  $c = 3$  and  $c = 4$
- E.  $c = 2$  and  $c = 4$

*Correct Answers:*

- B

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Use Part I of the Fundamental Theorem of Calculus to find the derivative of the function

$$h(x) = \int_1^x \frac{1}{t^2 + 2} dt.$$

- A.  $h'(x) = \frac{1}{3}$
- B.  $h'(x) = -\frac{2}{9}$
- C.  $h'(x) = -\frac{2x}{(x^2 + 2)^2}$
- D.  $h'(x) = \frac{1}{x^2 + 2}$
- E. None of the above

*Correct Answers:*

- D

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Find the value of the limit:

$$\lim_{x \rightarrow 0} 3 \frac{\tan 4x - 4x}{x^3}.$$

- A. 124
- B. 64
- C. 114
- D. 54
- E. 134

*Correct Answers:*

- B

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Find  $f(t)$  if  $f'(t) = 2t - 4 \sin(t)$  and  $f(0) = 5$ .

- A.  $f(t) = t^2 + 4 \cos(t)$
- B.  $f(t) = 2t - 4 \sin(t) + 5$
- C.  $f(t) = t^2 + 4 \cos(t) - 5$
- D.  $f(t) = t^2 + 4 \cos(t) + 1$
- E. None of the above

Correct Answers:

- D

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Let  $p(x)$  and  $q(x)$  be polynomials. Find

$$\lim_{x \rightarrow \infty} \frac{p(x)}{q(x)}$$

if the degree of  $p(x)$  is 2 and the degree of  $q(x)$  is 6.

- A. 9
- B.  $-4$
- C. 5
- D. 4
- E. 0

Correct Answers:

- E

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Find all of the critical numbers for the function  $g(x) = 2x^3 - 5x^2 + 4x - 145$ .

- A.  $x = \pm\sqrt{145}$
- B.  $x = 0$  only
- C.  $x = 2$  and  $x = 3$
- D.  $x = 5$  only
- E.  $x = \frac{2}{3}$  and  $x = 1$

Correct Answers:

- E

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Evaluate the indefinite integral  $\int (28t^3 - 6t^{-3})dt$ .

- A.  $84t^2 + 18t^{-4} + C$
- B.  $7t^4 + 3t^{-2} + C$
- C.  $t^4 - \ln(t) + C$
- D.  $84t^4 + 2t^{-2} + C$
- E.  $7t^2 - 6t^{-2} + C$

Correct Answers:

- B

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An athlete runs with velocity 24 km/h for 10 minutes, 18 km/h for 5 minutes, and 30 km/h for 5 minutes. Compute the total distance traveled.

- A. 6 km
- B. 8 km
- C. 9 km
- D. 7 km
- E. 5 km

Correct Answers:

- B

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If  $\int_0^6 f(x) dx = 13$  and  $\int_0^4 f(x) dx = 7$ , find  $\int_4^6 f(x) dx$ .

- A. 6
- B. -6
- C. 13
- D. 7
- E. 20

*Correct Answers:*

- A

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Evaluate the Riemann sum for  $f(x) = 6 - x^2$ ,  $0 \leq x \leq 2$  with four subintervals, taking the sample points to be the right endpoints.

- A. 8.25
- B. 10.75
- C. 10.25
- D. 9.25
- E. 9.75

*Correct Answers:*

- A

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Given that the graph of  $f(x)$  passes through the point  $(4, 69)$  and that the slope of its tangent line at  $(x, f(x))$  is  $10x - 6$ , find  $f(1)$ .

- A. 12
- B. -4.5
- C. 11
- D. 8
- E. 1

*Correct Answers:*

- A

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**16. (1 point)** local/GlobalPandemic/Exam03\_S21/MA113\_Exam03\_Problem16.pg

Given that  $\int_1^5 f(x) dx = 3$ , evaluate the integral  $\int_1^5 3f(x) dx$ .

Answer: \_\_\_\_\_

*Correct Answers:*

- 9

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**17. (1 point)** local/GlobalPandemic/Exam03\_S21/MA113\_Exam03\_Problem17.pg

The general antiderivative of  $f(x) = -8x^5 - x^3 + \frac{21}{x^2}$  is

*Correct Answers:*

- $(-1.33333) * x^6 + (-0.25) * x^4 - 21/x + C$

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18. (1 point) local/GlobalPandemic/Exam03\_S21/MA113\_Exam03\_Problem18.pg

Find the derivative:

$$\frac{d}{dx} \int_5^x \sec(6x+1) dx.$$

$f'(x) =$  \_\_\_\_\_

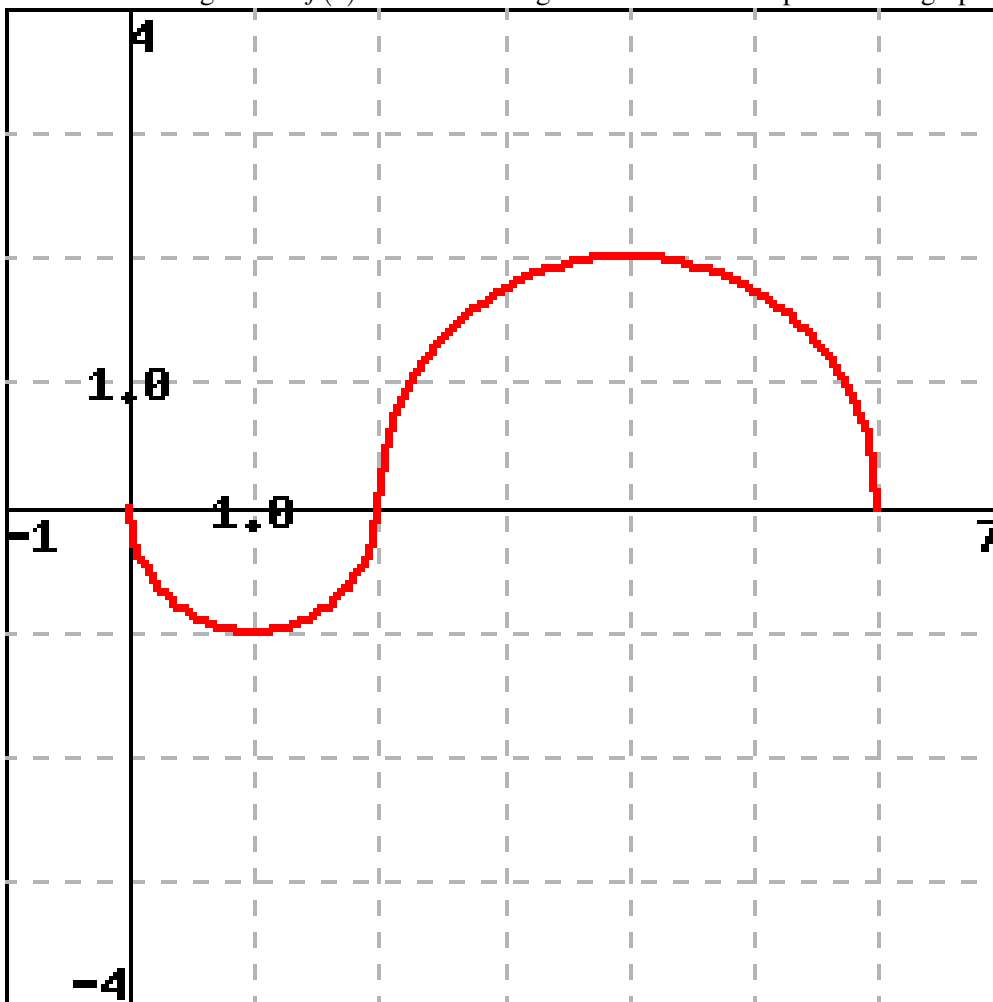
Correct Answers:

- $\sec(6x+1)$

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19. (1 point) local/GlobalPandemic/Exam03\_S21/MA113\_Exam03\_Problem19.pg

Evaluate the integrals for  $f(x)$  shown in the figure below. The two parts of the graph are semicircles.



a)  $\int_0^2 2f(x) dx =$  \_\_\_

b)  $\int_0^6 2f(x) dx =$  \_\_\_

Correct Answers:

- -3.14159
- 9.42478

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**20. (1 point)** local/GlobalPandemic/Exam03\_S21/MA113\_Exam03\_Problem20.pg

The rate (in mg carbon/(cubic meter)/hour) at which photosynthesis takes place for a species of phytoplankton is modeled by the function

$$P = \frac{20I}{I^2 + I + 4}$$

where  $I$  is the light intensity (measured in thousands of foot-candles). For what light intensity is  $P$  a maximum?

$I =$  \_\_\_\_\_

*Correct Answers:*

- 2