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16. (5 points) 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: _____

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20. (5 points) 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 = _____

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 $x = 1$

Find the value of the limit:

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

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

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

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

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

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. $7t^2 - 6t^{-2} + C$

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

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. $x = 0$

17. **(5 points)** `local/GlobalPandemic/Exam03_S21/MA113_Exam03_Problem17.pg`

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

_____

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

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

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

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

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

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. $[1.5, \infty)$

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 $c = 4$

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18. **(5 points)** `local/GlobalPandemic/Exam03_S21/MA113_Exam03_Problem18.pg`
Find the derivative:

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

$f'(x) =$ _____

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

Evaluate the Riemann sum for $f(x) = 6 - x^2$, $0 \le x \le 2$ 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

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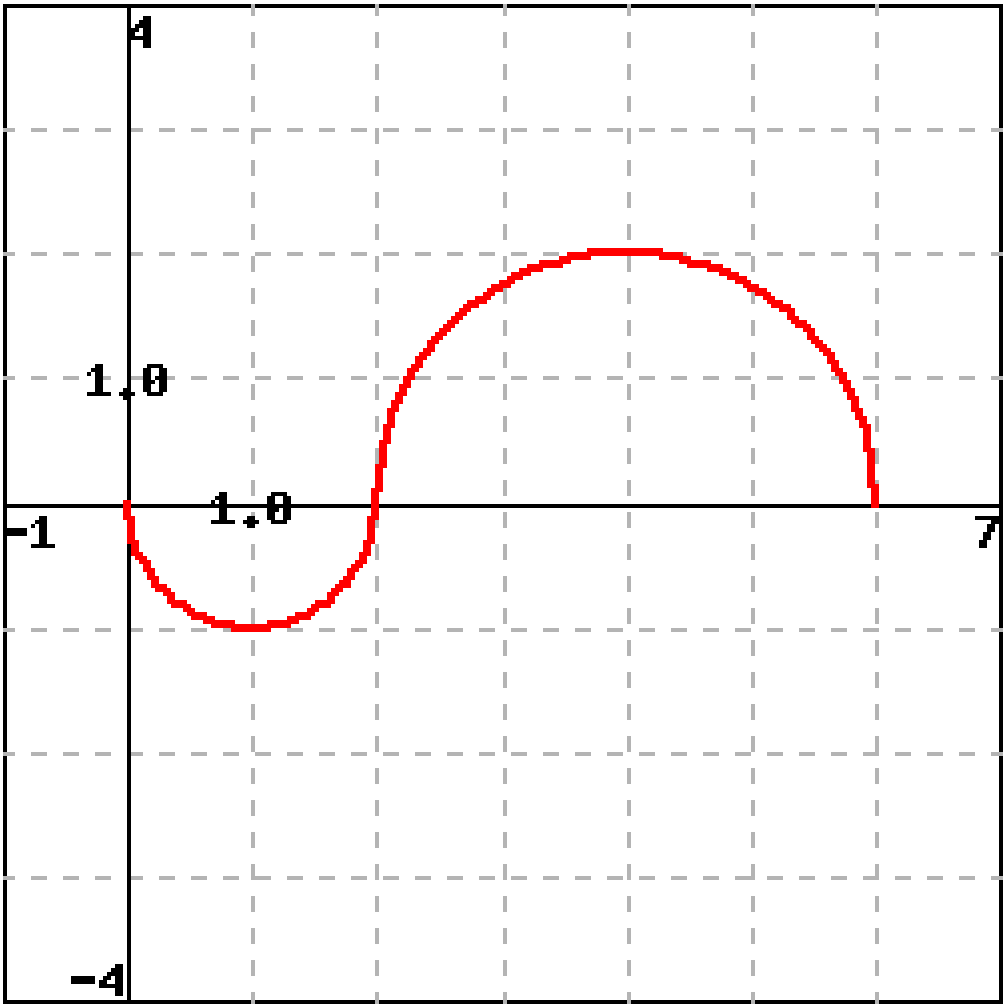
19. **(5 points)** `local/GlobalPandemic/Exam03_S21/MA113_Exam03_Problem19.pg`

Evaluate the integrals for $f(x)$ shown in the figure below. The two parts of the graph are semicircles. Make sure to give an exact answer (for example, using π), or to give 5 or 6 digits of accuracy.



a) $\int_0^2 2f(x)\,dx =$ ___
b) $\int_0^6 2f(x)\,dx =$ ___