

Test #3

Name: _____

Math 180, Prof. Beydler

Wednesday, May 27, 2020

Directions: We're working on the honor system here: no notes, books, phones, or computers during the test (except for using a computer to write your answers). Also, no getting help from other people. You may e-mail me to ask for clarification about any problem. **Show all work.** A **scientific calculator** is allowed. Write your answers in the indicated places, or box your answers. Good luck!

1. (3 points) Find the absolute maximum and minimum values of $f(x) = xe^{-x}$ on the interval $[0, 4]$.

Absolute maximum value: _____

Absolute minimum value: _____

2. (4 points) A rectangle has its two lower corners on the x -axis and its two upper corners on the curve $y = 4 - x^2$. What are the dimensions of such a rectangle that maximize its area?

Dimensions of rectangle: _____

3. (3 points) Find the most general antiderivative for $f(x) = \frac{2}{5x} - \frac{1}{\sqrt{x}} + \sin 3x - 2 \csc^2 x + \frac{4}{x^2+1}$

Answer: _____

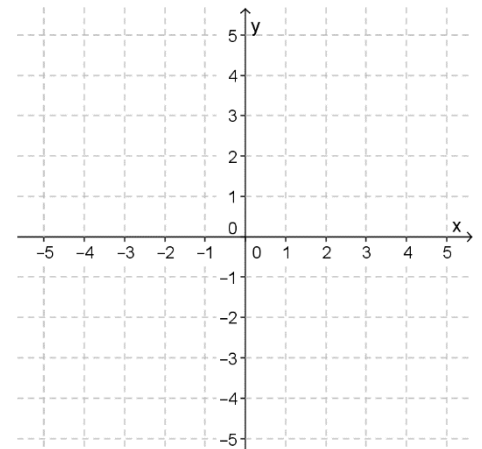
4. (3 points) A particle is moving with the given data. Find the position of the particle.
 $a(t) = 3t^2 - 5$, $s(0) = 2$, $s(2) = 3$

Position $s(t) =$ _____

5. (2 points) Graph the integrand and use the area under the graph to evaluate the integral.

$$\int_{-2}^2 (2 + \sqrt{9 - x^2}) dx$$

Answer: _____



6. Evaluate. Write your answers in exact form.

a) (3 points) $\int_0^{1/2} \left(\frac{3}{\sqrt{1-x^2}} + e^{2x} \right) dx$

Answer: _____

b) (3 points) $\int 3^{\tan x} \sec^2 x dx$

Answer: _____

c) (3 points) $\int (4x^2 + 1)e^{-2x} dx$

Answer: _____

d) (3 points) $\int x^3 \ln x \, dx$

Answer: _____

e) (3 points) $\int \frac{6}{x(\ln x)^2} \, dx$

Answer: _____

f) (3 points) $\int_{\pi/3}^{\pi/2} \csc x \cot x \, dx$

Answer: _____

7. (2 points) Estimate the distance traveled in 24 seconds given the following sample velocities using right-endpoint values. Be sure to write the units for your answer.

Time (s)	0	6	12	18	24
Velocity (m/s)	4	5.2	5.4	4.9	4.1

Answer: _____

8. Estimate the area under the graph of $f(x) = \sqrt{x + 1}$ between $x = 1$ and $x = 3$ using...

a) (2 points) ...an upper sum with four rectangles of equal width. Write your answer to 6 decimal places.

Answer: _____

b) (2 points) ...midpoints with four rectangles of equal width. Write your answer to 6 decimal places.

Answer: _____

9. Suppose that $\int_3^{-1} f(x) dx = -4$ and $\int_3^5 f(x) dx = 3$. Find the following.

a) (1 point) $\int_{-1}^3 f(x) dx$

Answer: _____

b) (1 point) $\int_{-1}^5 f(x) dx$

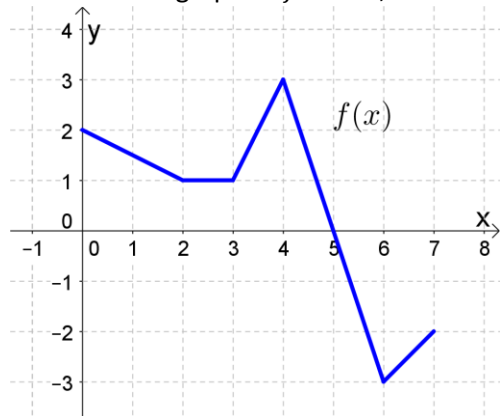
Answer: _____

10. (5 points) Evaluate the following integral using Riemann sums with right endpoints.

$$\int_0^3 (x^2 + 2x) dx$$

Answer: _____

11. Given the graph of f below, find the following integrals.



a) (1 point) $\int_0^2 f(x) dx =$ _____

b) (1 point) $\int_2^4 f(x) dx =$ _____

c) (1 point) $\int_4^7 f(x) dx =$ _____

12. (4 points) Suppose the velocity function of a particle is $v(t) = t^2 + 3t - 4$ (in meters per second). Find the distance traveled by the particle during the time period $0 \leq t \leq 4$. Be sure to write units for your answer.

Distance traveled: _____

Note: Be sure to double check your work. And remember to turn in your homework and extra credit! ☺

Here are some formulas that I promised to give:

$$\frac{d}{dx}(\csc^{-1} x) = \frac{-1}{|x|\sqrt{x^2-1}}$$

$$\frac{d}{dx}(\sec^{-1} x) = \frac{1}{|x|\sqrt{x^2-1}}$$

$$\frac{d}{dx}(\cot^{-1} x) = \frac{-1}{1+x^2}$$

$$\frac{d}{dx}(\operatorname{csch} x) = -\operatorname{csch} x \coth x$$

$$\frac{d}{dx}(\operatorname{sech} x) = -\operatorname{sech} x \tanh x$$

$$\frac{d}{dx}(\operatorname{coth} x) = -\operatorname{csch}^2 x$$

$$\frac{d}{dx}(\sinh^{-1} x) = \frac{1}{\sqrt{1+x^2}}$$

$$\frac{d}{dx}(\cosh^{-1} x) = \frac{1}{\sqrt{x^2-1}}$$

$$\frac{d}{dx}(\tanh^{-1} x) = \frac{1}{1-x^2}$$

$$\frac{d}{dx}(\operatorname{csch}^{-1} x) = -\frac{1}{|x|\sqrt{x^2+1}}$$

$$\frac{d}{dx}(\operatorname{sech}^{-1} x) = -\frac{1}{x\sqrt{1-x^2}}$$

$$\frac{d}{dx}(\operatorname{coth}^{-1} x) = \frac{1}{1-x^2}$$