

Test #3

Name: _____

Math 180, Section 5, Prof. Beydler

Thursday, November 30, 2017

Directions: Show all work. No books or notes. A **scientific calculator** is allowed. Your desk and lap must be clear (no phones, no smart watches, etc.). If you have a phone in your lap or on your chair, it is considered cheating, and you will receive a zero on this test. 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 $[0, 3]$.

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 $f(x) = \frac{3}{\sqrt[3]{x}} - \frac{2}{5x} - \cos 2x - 4 \csc^2 x + \frac{2}{\sqrt{1-x^2}}$

Answer: _____

4. (3 points) A particle is moving with the given data. Find the position of the particle.
 $a(t) = 3t^2 - 5$, $s(0) = 0$, $s(1) = 4$

Position $s(t) =$ _____

5. (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)	5	4.3	4.6	5.1	2.5

Answer: _____

6. 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: _____

7. Suppose that $\int_3^{-2} f(x) dx = -2$ and $\int_3^5 f(x) dx = 4$. Find the following.

- a) (1 point) $\int_{-2}^3 f(x) dx$

Answer: _____

- b) (1 point) $\int_{-2}^5 f(x) dx$

Answer: _____

8. (5 points) Evaluate the following integral using Riemann sums with right endpoints.

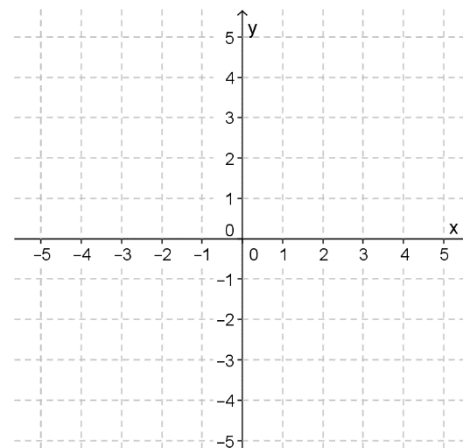
$$\int_0^2 (x^3 + 2x) dx$$

Answer: _____

9. (2 points) Graph the integrand and use the area under the graph to evaluate the integral.

$$\int_{-2}^4 (1 + |x - 2|) dx$$

Answer: _____



10. (2 points) Use Part 1 of the Fundamental Theorem of Calculus to find the derivative of

$$f(x) = \int_{\cos x}^5 \frac{1}{1+t^3} dt$$

Answer: _____

11. Evaluate. Write your answers in exact form.

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

Answer: _____

b) (3 points) $\int_0^{\pi/2} 2^{\cos x} \sin x dx$

Answer: _____

c) (1 point) $\int_{-2}^2 |x| \sin x \, dx$

Answer: _____

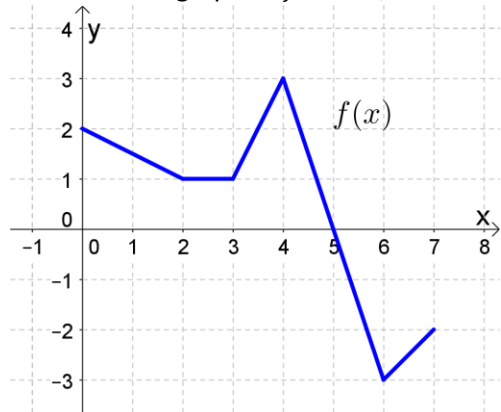
d) (3 points) $\int x^2 e^{-3x} \, dx$

Answer: _____

e) (3 points) $\int_0^{\pi/3} \sec^2 x \, dx$

Answer: _____

12. 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) $\int_4^7 f(x) \, dx =$ _____

13. (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 $0 \leq t \leq 3$. Be sure to write units for your answer.

Distance traveled: _____

Note: Be sure to double check your work. And don't forget to turn in your homework! ☺

Here are some formulas that I promised to give:

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

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

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

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

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

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

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

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

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

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

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

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