

Name _____ Rec. Instr. _____
Signature _____ Rec. Time _____

Math 220
Exam 3
November 16, 2017

No books, calculators, or notes are allowed. Please make sure that your cell phone is turned off. You will have 75 minutes to complete the exam.
Show your work.

Problem	Points	Points Possible	Problem	Points	Points Possible
1		18	6		6
2		18	7		7
3		10	8		10
4		8	9		6
5		7	10		10

Total Score:

1. Evaluate the following indefinite integrals.

A. (6 points) $\int \frac{\sqrt{x} - \sqrt{2} x^5}{x} dx$

B. (6 points) $\int 3x \sin(5x^2) dx$

C. (6 points) $\int x\sqrt{x+2} dx$

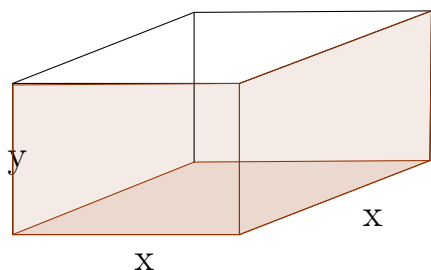
2. Evaluate the following limits.

A. (6 points) $\lim_{t \rightarrow 0} \frac{1 + t - \cos(t)}{t^2 + \sin(2t)}$

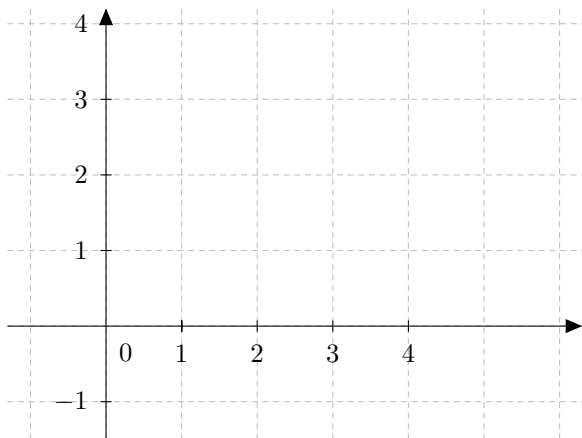
B. (6 points) $\lim_{x \rightarrow \infty} x^2 2^{-x}$

C. (6 points) $\lim_{x \rightarrow 0^+} x^{2x}$

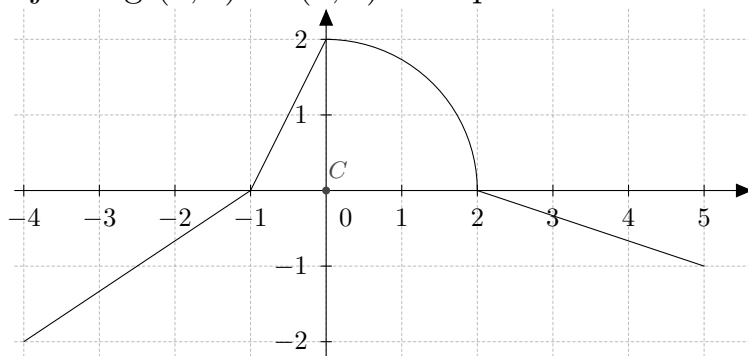
3. (10 points) A box with square base and open top is formed from 2 materials. The base costs \$4 per square foot, while the four sides cost \$1 per square foot. If the total cost for the base and four sides is fixed to be \$120, find the dimensions that maximize the volume of the box.



4. (8 points) Estimate the area below the curve $y = \sqrt{x}$ over the interval $[1,4]$ using L_3 , the left end point approximation with three intervals. Also, make a sketch of the graph of $y = \sqrt{x}$ and illustrate the rectangles on your graph. (Leave your answer as a sum. Do not simplify. $\sqrt{2} \approx 1.4$, $\sqrt{3} \approx 1.7$.)



5. (7 points) For the function $f(x)$ graphed below evaluate the given integral. The arc joining $(0, 2)$ to $(2, 0)$ is a quarter-circle.



$$\int_{-4}^5 f(x) dx$$

6. (6 points) Evaluate the following integral. Just use symmetry and geometry.

$$\int_{-2}^2 \sin^3(5x) + \sqrt{4 - x^2} \, dx$$

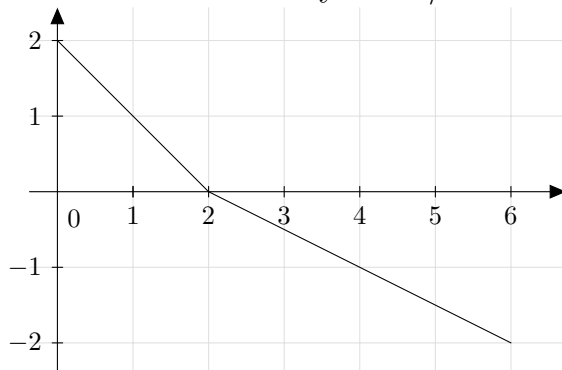
7. (7 points) Find the average value of $f(x) = \frac{1}{x}$ over the interval $[1, e]$.
(Here, e is the natural logarithm base.)

8. (10 points) Solve the initial value problem for $f(t) : f'(t) = 2e^{-2t}, f(0) = 1$.

9. (3 points) **A.** Find $\frac{d}{dx} \int_2^x \frac{\cos(t^2)}{2+t} dt$

(3 points) **B.** Find $\frac{d}{dx} \int_{x^3}^5 \frac{\cos(t^2)}{2+t} dt$

10. The velocity function $v = v(t)$ for an object moving along a straight line is graphed below. The horizontal axis is time measured in seconds, and the vertical axis is velocity in m/sec .



- a. (5 points) Let $s = s(t)$ denote the position of the object. If the object is at position $s = 3$ when $t = 0$, where is it after 6 seconds?
- b. (5 points) Find the total distance the object travels during the time interval $[0, 6]$ seconds.