Name _____   Rec. Instr._____

Signature _____   Rec. Time_____

Math 220
Exam 3
November 21, 2019

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. Unless instructed otherwise, **show your work** on each problem.

Problem	Points	Points Possible	Problem	Points	Points Possible
1		25	5		10
2		12	6		8
3		10	7		14
4		10	8		11

Total Score	

1. (5 points each) Evaluate the following:

A. $\displaystyle \lim_{\theta \to 0} \frac{\theta^2 + \theta^3}{\sin(\theta)} =$

B. $\displaystyle \lim_{x \to \infty} \frac{3x + e^x}{5x^2 + 7} =$

C. $\displaystyle \int \left(\frac{1}{x^2} + 3\cos(x) \right) dx =$

D. $\displaystyle \frac{d}{dx} \int_x^5 3t^7 \cos(t^9) \, dt =$

E. $\displaystyle \int_0^\pi (2\sin(\theta) + 1) \, d\theta =$
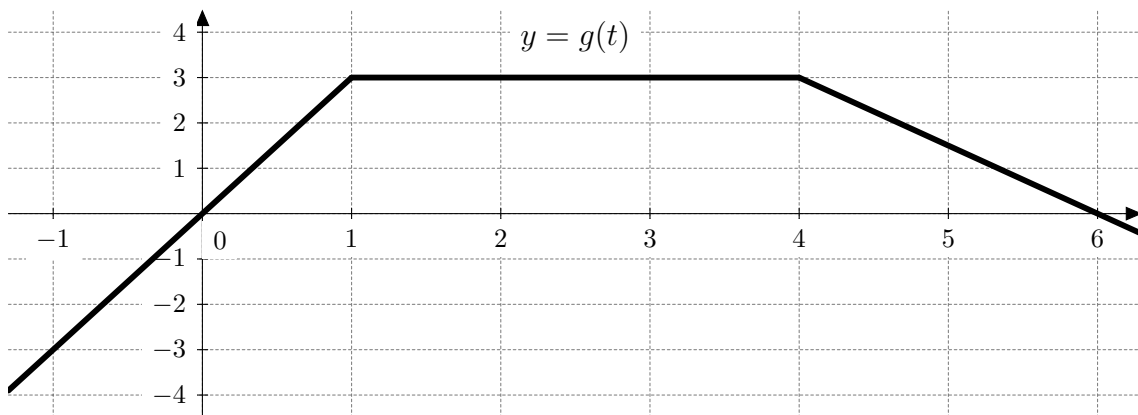
2. (4 points each) $y = g(t)$ is plotted above. Let $A(x) = \displaystyle\int_0^x g(t)\, dt$. Find the following quantities.

A. $\displaystyle\int_{-1}^{1} g(t)\, dt =$

B. $\displaystyle\int_{4}^{2} g(t)\, dt =$

C. $A'(2) =$

3. (10 points) Find $f(x)$ if $f''(x) = e^x + 2$, $f'(0) = 7$, and $f(0) = -5$.
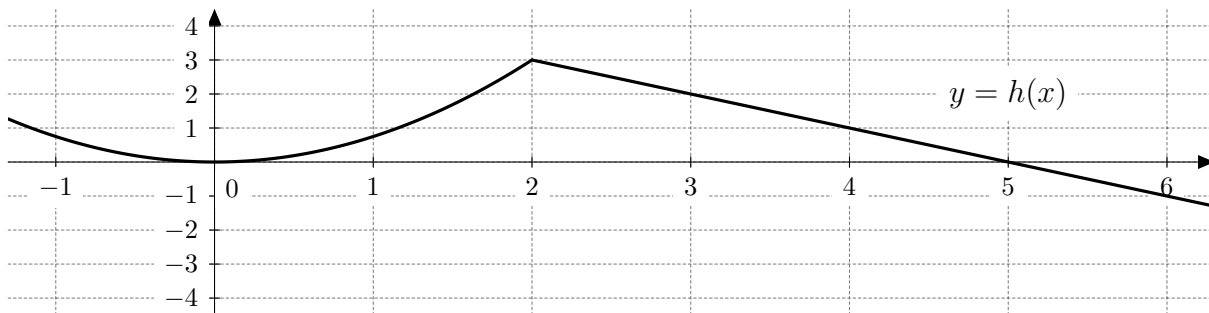
4. (10 points) Estimate $\int_0^6 h(x)\,dx$ by computing R_3, the Right-Endpoint Approximation with 3 subintervals. Also, illustrate the rectangles on the graph above.

5. The cost in dollars of producing x pounds of a chemical in a factory is given by $C(x)$. Suppose that the "marginal cost" is $C'(x) = \dfrac{x}{2} + 1$ \$/pound.

   A. (7 points) Find $\int_2^4 C'(x)\,dx$. (Include units with your answer.)

   B. (3 points) What does $\int_2^4 C'(x)\,dx$ represent?

6. (8 points) Suppose that a particle has position $s(t)$ feet at time t seconds and a velocity function $s'(t) = 3t^2 - 2t$ ft/s. If $s(0) = 5$ ft, find $s(2)$. (Include units with your answer.)

7. (7 points each) Evaluate the following:

A. $\displaystyle\int_0^{\pi/2} e^{2\sin(\theta)} \cos(\theta) \, d\theta =$

B. $\displaystyle\int x\sqrt{x-2} \, dx =$

8. (11 points) A rectangular **open-topped** box is to have volume 18 m^3. The length of the base is to be **three times its width**. What dimensions minimize the amount of material needed to make the box? (Justify why your answer corresponds to an absolute minimum. Include units with your answer.)