Prob	Pts
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

Math 121 — **Calculus II** — Spring 2004

Final Exam
Instructor: ________________

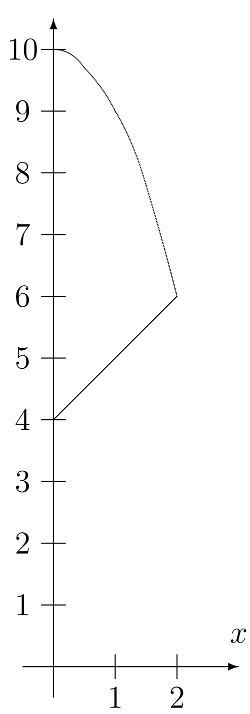
Name: (print neatly)____________________
(sign)____________________

1. (**5 pts.**) Suppose that the acceleration of a particle along the x axis is given $a(t) = 1 - e^{-2t}$ for $0 \le t \le 5$, and suppose that at $t = 5$ we have $x(5) = 0$ and $v(5) = 5$.

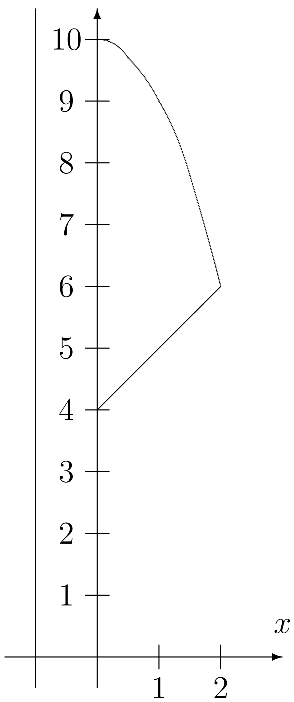
What is the velocity of the particle at $t = 0$?

2. (**10 pts.**) Consider the region sketched below which is bounded by the y-axis, the line $y = x + 4$ and the curve $y = 10 - x^2$.

Find the area of the region



3. (**10 pts.**) Set up the integral(s) to compute the volume of the solid of revolution generated by rotating the region bounded by the y-axis, the line $y = x + 4$ and the curve $y = 10 - x^2$ around the axis $x = -1$.



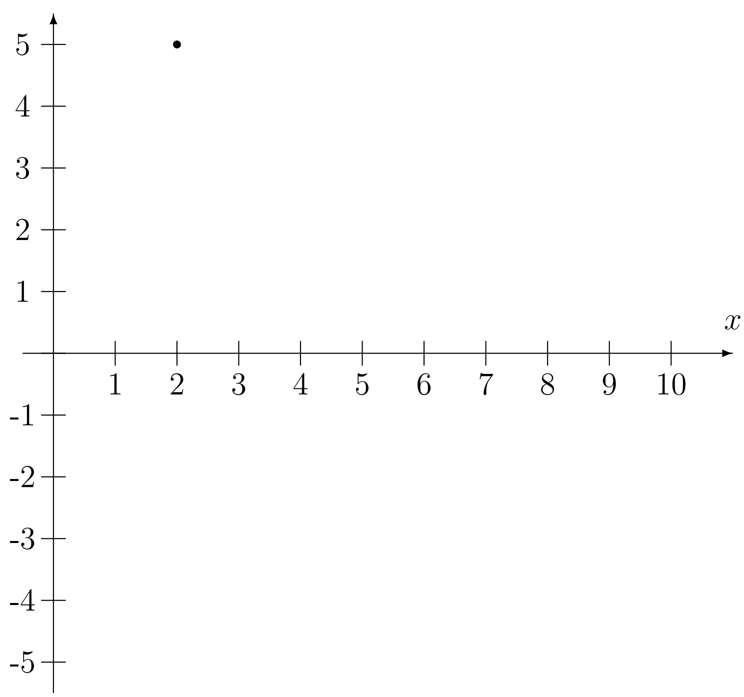
4. (**4 pts.**) Suppose $f(0) = 3$, $f'(0) = 0$, $f''(0) = -1$, $f(1) = 6$, $f'(1) = -1$, $f''(1) = -1$, $f(2) = 9$, $f'(2) = 2$, $f''(2) = 0$.

Compute $\int_0^2 f'(x)\, dx$ via the Fundamental Theorem of Calculus.

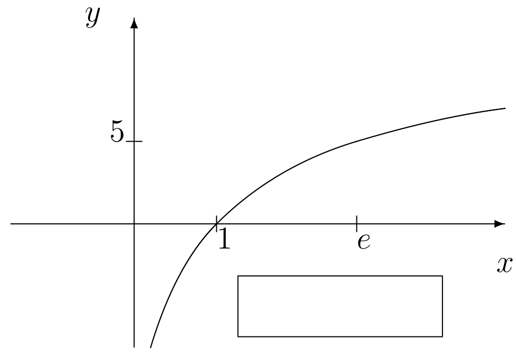
5. (**5 pts.**) Suppose that $|f(x)| \leq 3$ for all x.

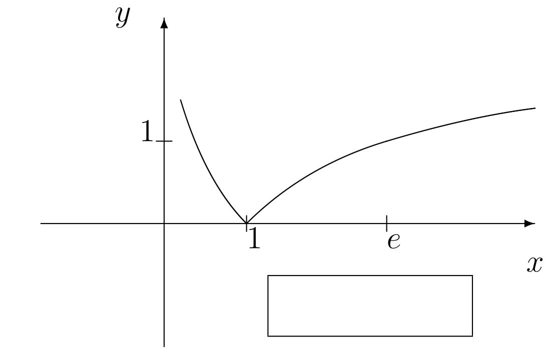
Show that $\displaystyle\int_{-2}^{2} \frac{[f(x)]^2}{2}\, dx < 50$

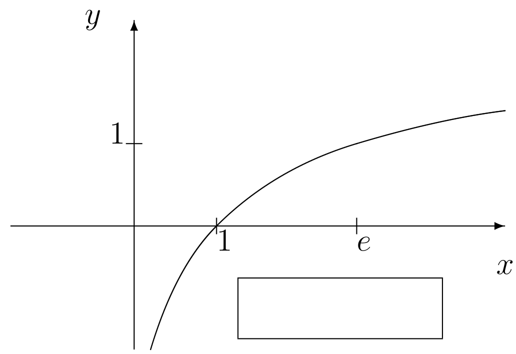
6. (**5 pts.**) On the axes below sketch the graph of any continuous function $y = f(x)$ with domain $0 \leq x \leq 10$ such that $f(2) = 5$ and $\displaystyle\int_{2}^{8} f(x)\, dx = 0$.

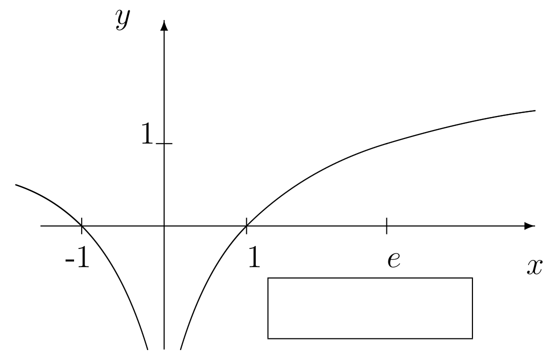


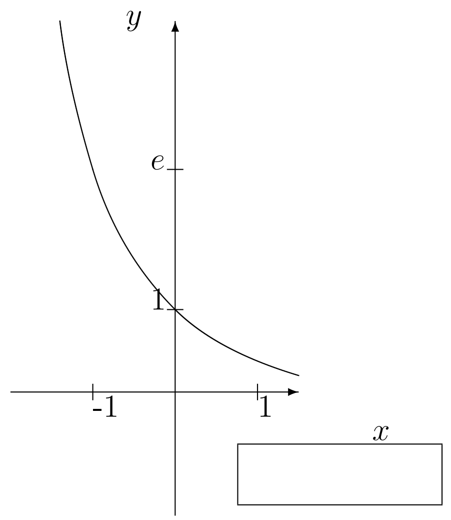
7. (**10 pts.**) Consider each of the graphs below and label it with the correct function from the list at the bottom of the page:











$y = 4 + \ln(x)$

$y = \ln(x)$

$y = \ln(x^5)$

$y = \ln|x|$

$y = |\ln(x)|$

$y = e^{-x}$

$y = |e^x|$

8. (**15 pts.**) Evaluate the following derivatives.

a. $\dfrac{d}{dx}\left[\ln\left(\dfrac{e^{3x}\sqrt{2x+1}}{x}\right)\right] =$

b. $\dfrac{d}{dx}\left(\dfrac{e^{2x}+e^{-2x}}{2}\right) =$

c) $\dfrac{d}{dx}\left[\sin^{-1}(3x)\right]^4 =$

9. (**36 pts.**) Compute the following integrals:

a) $\int xe^{-x^2}\, dx$

b) $\int xe^{-x}\, dx$

c) $\int \sqrt{1-4x^2}\,dx$

d) $\int \frac{(1-x)}{\sqrt{x}}\,dx$

e) $\int \sec^4(x)\tan^4(x)\,dx$

f) $\int \frac{1}{x\ln(x)}\,dx$