Math-124 Calculus
Fall 2008
12/05/08

Note: Show all work. Incorrect answers without support will receive no credit. Also, please read ALL instructions carefully and answer each problem to the best of your ability. Good Luck!
Name: _____

Exam 4

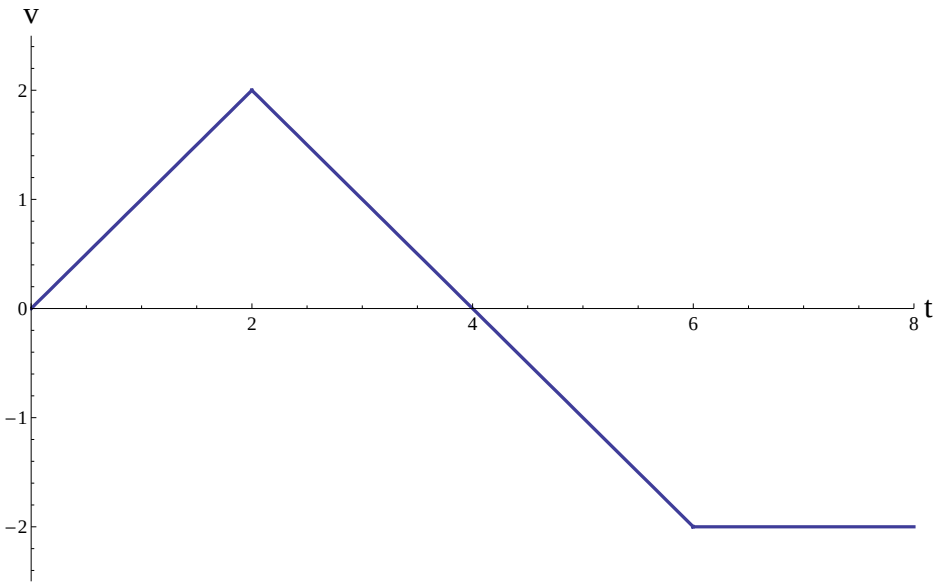
#1. Suppose the data below gives the number of kittens (in millions of kittens per year) born between the years 1970 and 2000.

Year	1970	1980	1990	2000
Number of Kittens Born	1	1.4	2.0	2.3

- a) Using 10 year increments, find an upper bound for the number of kittens born between the years 1970 and 2000.

- b) Using 10 year increments, find a lower bound for the number kittens born between the years 1970 and 2000.

#2. The figure below shows the velocity $v(t)$ in cm/s of particle moving along the x-axis. Assuming that at $t = 0$ the particle starts at 0, answer the following questions.



- a) At what time is the particle farthest from 0?

- b) How far is the particle from 0 at this time?

- c) At what time will the particle return to 0?

- d) Rank the quantities $\int_0^8 v(t)\,dt$, $\int_0^8 |v(t)|\,dt$, and $\left|\int_0^8 v(t)\,dt\right|$ from largest to smallest.

#3. You are given that

$$\int_0^5 g(x)\,dx = 7\ ,\ \int_0^5 f(x)\,dx = 3\ ,\ \int_2^5 f(x)\,dx = 2,$$

and in addition $f(x)$ is an odd function.

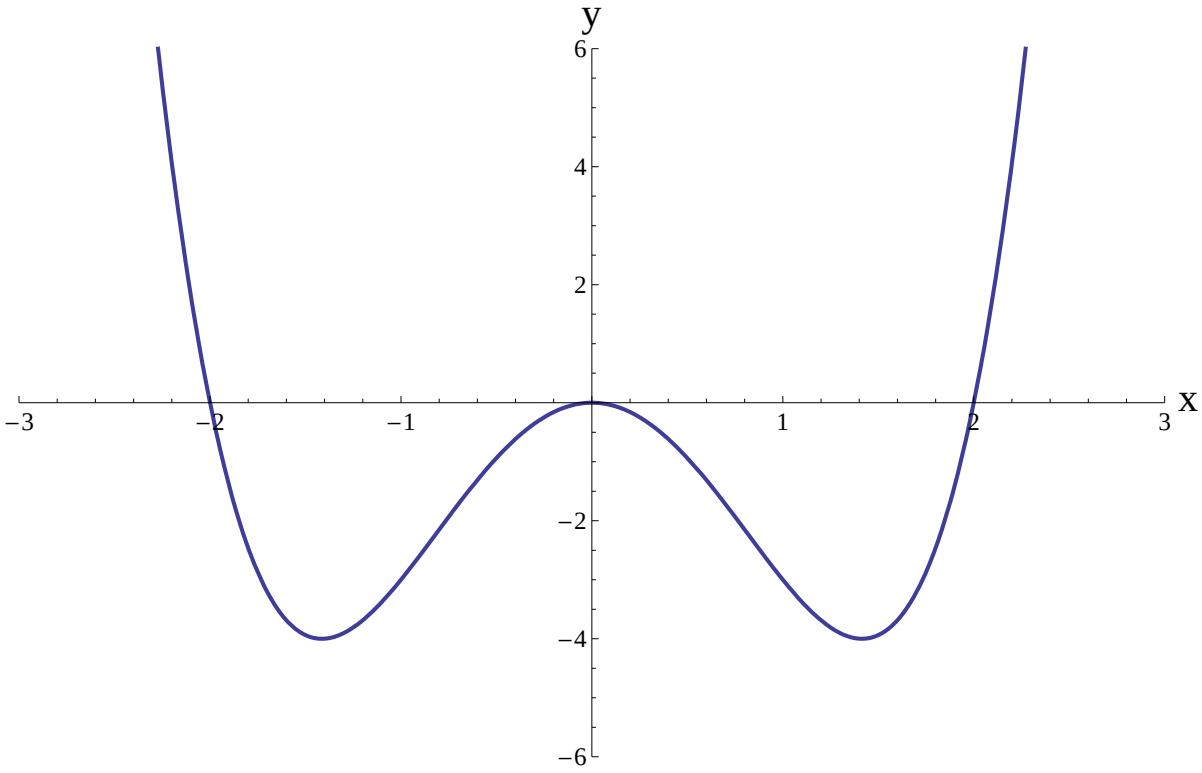
- a) What is the exact value of $\displaystyle\int_5^0 g(x)\,dx$.

- b) What is the exact value of $\displaystyle\int_0^5 (6 - Bg(x) + f(x))\ dx$, where B is a constant.

- c) What is the exact value of $\displaystyle\int_0^2 f(x)\,dx$.

- d) What is the exact value of $\displaystyle\int_{-2}^0 f(x)\,dx$.

#4. The graph of $f(x)$ is given below. Let $F'(x) = f(x)$, and suppose that $F(0) = 0$. On the same set of axis sketch a possible sketch of $F(x)$, be sure to accurately label any local maximum and minimums and inflection points.



#5. Find the following anti-derivatives.

- a) $\displaystyle\int \frac{x+\sqrt{x}}{x^2}\,dx$

- b) $\displaystyle\int (5e^v - \sin(v))\,dv$

- c) $\displaystyle\int \frac{x}{\sqrt{x^2+3}}\,dx$

- d) $\displaystyle\int \frac{1}{1+t^2}\,dt$

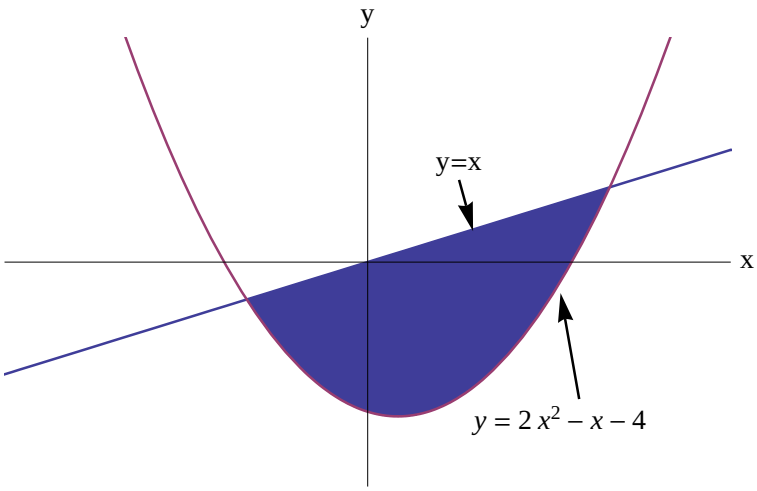
- e) $\displaystyle\int \sin(\theta)(1+\cos(\theta))^2\,d\theta$

#6. Find the solution to the differential equation

$$\frac{dy}{dx} = x^3 + x^2,$$

so that one has $y(2) = 3$.

#7. Calculate the area bounded between the graphs of $f(x) = x$ and $g(x) = 2x^2 - x - 4$.



#8. Let $G(t) = \int_3^{1/t} e^{1/x}\, dx$

- a) Find $G'(t)$.

- b) Is $G(t)$ an increasing or decreasing function of t? You must provide some explanation to receive credit.

I hate quotations. Tell me what you know. *Ralph Waldo Emerson*