

Sample1

Math 231: Calculus 1 Exam 3 May 1, 2007 Class of Professor Kevin O'Bryant

Read each question carefully, answer each question completely, and show all of your work. Write your solutions clearly and legibly; no credit will be given for illegible solutions. Remove sunglasses and brimmed hats. Turn your cell phones off. No notes, human assistance, or cheat-sheets. You may **not** use a calculator.

Each problem is worth 3 points; although there are 6 problems there is a maximum of 15 points.

1. The function shown in Figure 2 is $f'(x)$. On the same axes, sketch a possible function $f(x)$.

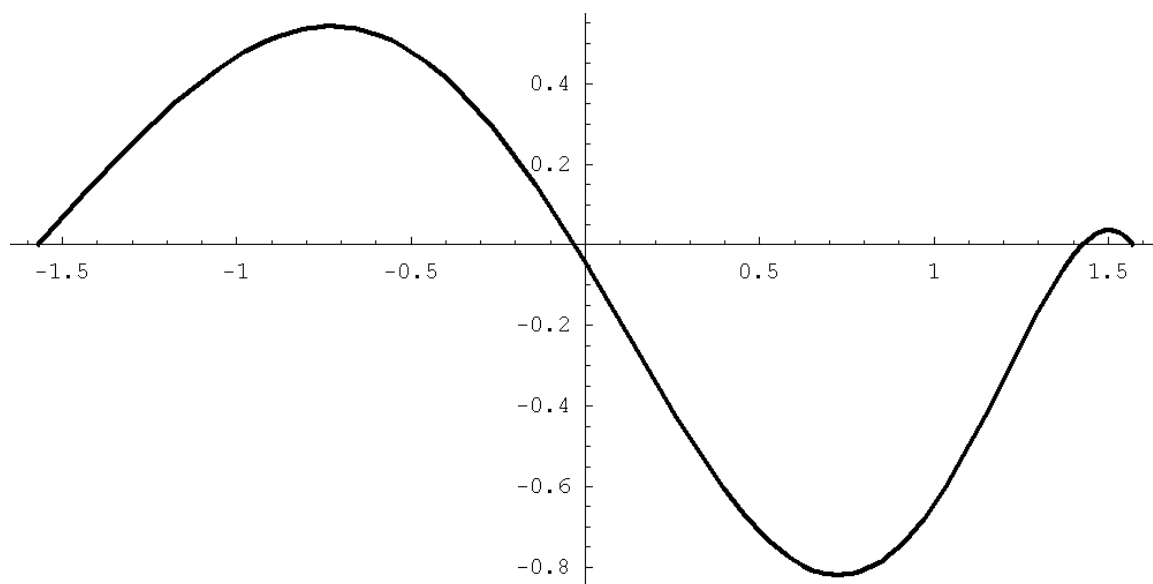


Figure 1: $f'(x)$

$$2. \int_5^6 \left(\frac{d}{dx} x^{\cos(x)} \right) dx$$

3. State the definition of $\int_a^b f(x) dx$ as a limit.

4. Use a Riemann sum with $n = 5$ to estimate $\int_5^7 (1 + x) dx$. Then use the Fundamental Theorem of Calculus to compute the definite integral precisely.

5. A certain type of washing machine can be sold for 600 dollars each. The cost in dollars to produce the k -th machine is

$$C(k) = 2000 \ln \left(\frac{100k}{k^2 + 5000} + 1 \right).$$

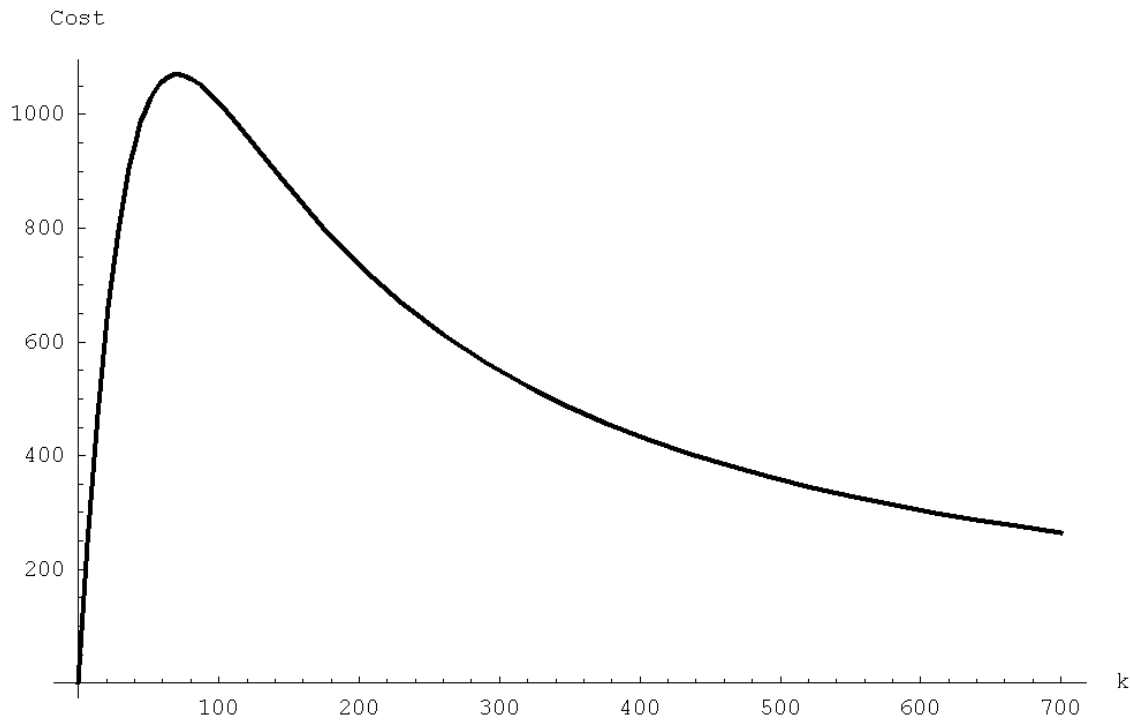


Figure 2: $C(k)$

Write an equation (involving a definite integral) whose solutions estimate the number of machines one must make to break even, i.e., the number of machines one must manufacture so that the cost of production and the total sales price are the same.

How many solutions should the equation have?

Use the graph, and the concept of signed area, to approximate a solution to your equation. Explain your choice.

6. Compute the derivative with respect to x of the function

$$F(x) = \int_0^{x^2} e^{-t^2/2} dt.$$

7. Find the area between the parabola $-2x^2 + 4x + 4$ and the line $2(x - 4)$.

8. Give antiderivatives of the following functions:

$$(a) \int \frac{4(2 - 4x)}{-2x^2 + 2x + 3} dx =$$

$$(b) \int 4e^{5x^2+5x-4}(10x + 5) dx =$$

$$(c) \int \frac{3(6x + 3)}{(3x^2 + 3x + 2)^2 + 1} dx =$$

$$(d) \int -4(-2x - 2) \tan(x^2 + 2x + 2) dx =$$

$$(e) \int 2(2x - 2) \cos(-x^2 + 2x + 3) dx =$$

$$(f) \int -4(-4x - 4) \sin(2x^2 + 4x + 2) dx =$$

Sample2

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Read each question carefully, answer each question completely, and show all of your work. Write your solutions clearly and legibly; no credit will be given for illegible solutions. Remove sunglasses and brimmed hats. Turn your cell phones off. No notes, human assistance, or cheat-sheets. You may **not** use a calculator.

Each problem is worth 3 points; although there are 6 problems there is a maximum of 15 points.

1. A certain type of washing machine can be sold for 600 dollars each. The cost in dollars to produce the k -th machine is

$$C(k) = 2000 \ln \left(\frac{100k}{k^2 + 5000} + 1 \right).$$

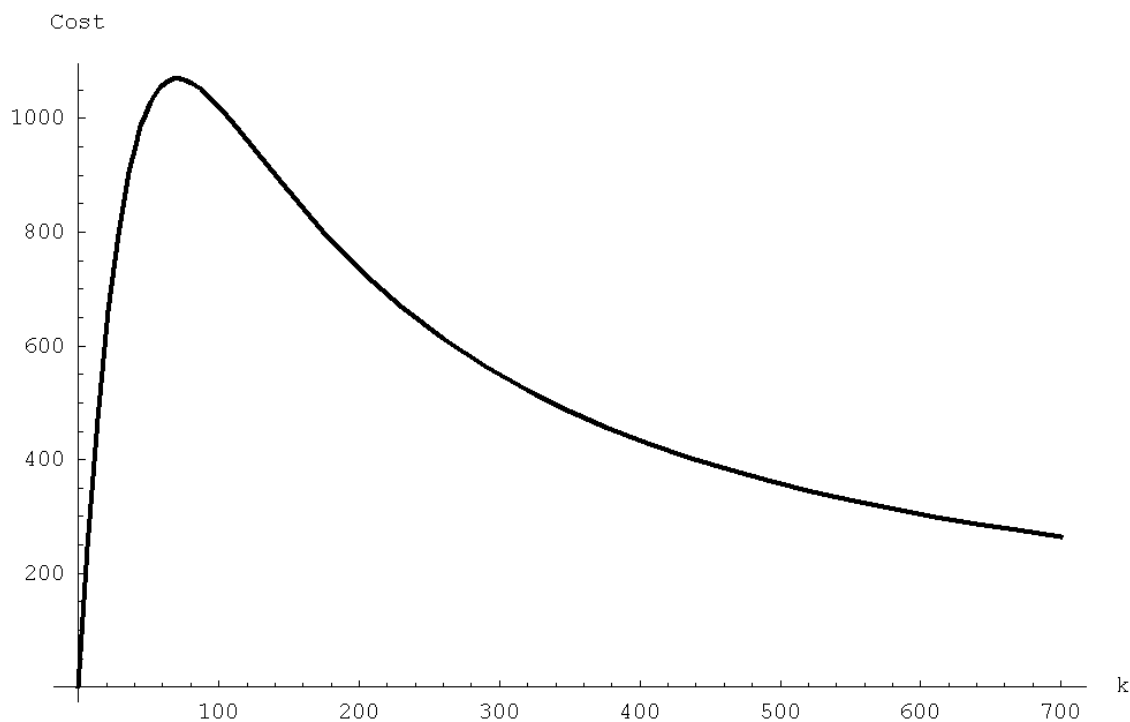


Figure 1: $C(k)$

Write an equation (involving a definite integral) whose solutions estimate the number of machines one must make to break even, i.e., the number of machines one must manufacture so that the cost of production and the total sales price are the same.

How many solutions should the equation have?

Use the graph, and the concept of signed area, to approximate a solution to your equation. Explain your choice.

2. Compute the derivative with respect to x of the function

$$F(x) = \int_0^{6x+5} e^{-t^2/2} dt.$$

3. Give antiderivatives of the following functions:

$$(a) \int 3(10x + 3) \tan(5x^2 + 3x + 2) dx =$$

$$(b) \int \frac{3(8x - 4)}{4x^2 - 4x + 4} dx =$$

$$(c) \int 3(8x + 5) \cos(4x^2 + 5x + 4) dx =$$

$$(d) \int \frac{3(2x + 3)}{(x^2 + 3x + 3)^2 + 1} dx =$$

$$(e) \int -2(2x + 2) \sin(-x^2 - 2x + 5) dx =$$

$$(f) \int 3e^{3x^2 - 4x + 3}(6x - 4) dx =$$

4. State the definition of $\int_a^b f(x) dx$ as a limit.

$$5. \int_1^7 \left(\frac{d}{dx} e^{\sqrt[3]{2x+4}} \right) dx$$

6. Use a Riemann sum with $n = 5$ to estimate $\int_{-5}^{-4} (5 + x) dx$. Then use the Fundamental Theorem of Calculus to compute the definite integral precisely.

7. The function shown in Figure 2 is $f'(x)$. On the same axes, sketch a possible function $f(x)$.

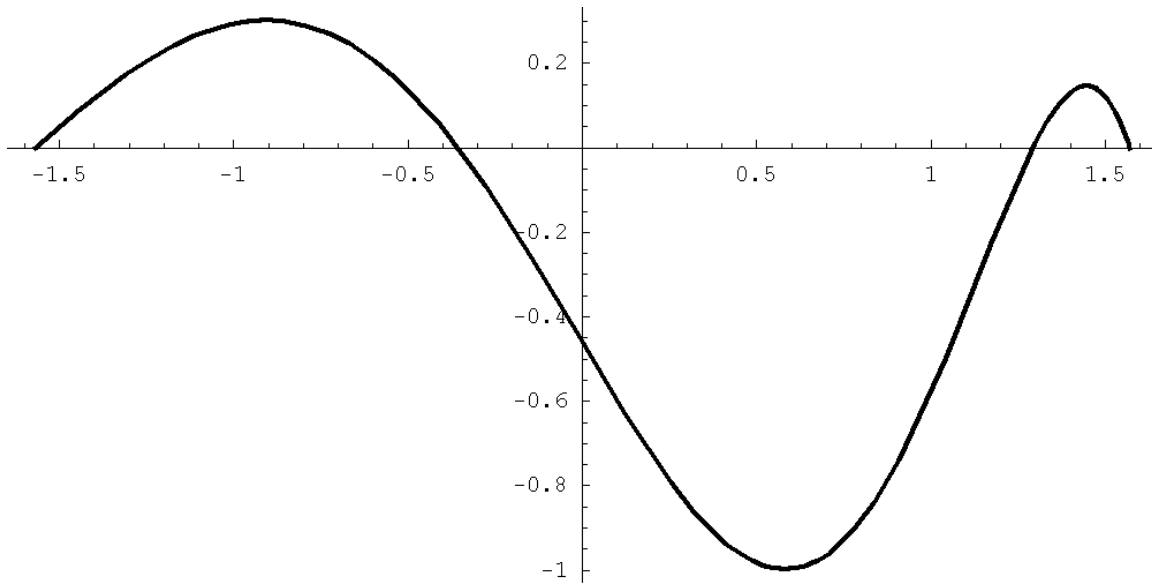


Figure 2: $f'(x)$

8. Find the area between the parabola $3x^2 + 2x + 2$ and the line $2(x + 7)$.