

This examination has 10 questions, worth a total of 40 points. The numbers in the margin describe the marking scheme.

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Last name (please print): \_\_\_\_\_

First name: \_\_\_\_\_

Student number: \_\_\_\_\_

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### Instructions

1. Time: 60 Minutes.
2. Fill in the information above.
3. Please do not open the examination booklet until you are told to do so.
4. Attempt all questions. Make sure there are 7 pages and 10 questions.
5. The multiple choice questions will be marked for answer only (e.g., A, B, ... H), and you need not show your work.
6. Show all your work for Questions 9 and 10.
7. You may use the back of the pages for rough work.
8. You may use pen or pencil to write the exam. However, exams written in pencil are not eligible for remarking.
9. Please no books, no notes and no programmable or calculus calculators.

Question	Marks
1-8	
9	
10a	
10b	
Total	
	40

- 2 1. Express the definite integral  $\int_1^x \frac{1}{2u} du$  in terms of  $x$  (where  $x > 1$ ).

- A)  $\frac{x-1}{2u}$  E)  $\ln\left[\frac{x}{2}\right]$   
B)  $\frac{1}{2} \ln x$  F)  $\ln \sqrt{x} - \ln\left[\frac{1}{2}\right]$   
C)  $\frac{1}{2}[\ln x - 1]$  G)  $\frac{1}{2x} - \frac{1}{2}$   
D)  $\frac{1}{2} - \frac{1}{2x^2}$  H) does not exist

Answer=\_\_\_\_\_

- 2 2. Evaluate the indefinite integral  $\int (e^x + e^{-x})^2 dx$ .

- A)  $2x + \frac{e^{2x}}{2} - \frac{e^{-2x}}{2} + C$  E)  $e^{2x} + e^{-2x} + C$   
B)  $\frac{1}{2}e^{2x} + \frac{1}{2}e^{-2x} + C$  F)  $e^{2x} - e^{-2x} + C$   
C)  $\frac{1}{3}(e^{x^2/2} + e^{-x^2/2})^3 + C$  G)  $2e^{2x} - 2e^{-2x}$   
D)  $\frac{1}{2}e^{2x} - \frac{1}{2}e^{-2x} + C$  H)  $\frac{1}{3}(e^x + e^{-x})^3 + C$

Answer=\_\_\_\_\_

- 2 3. The marginal cost function is  $C'(x) = 5 + 0.002x$  dollars per unit.  
If  $C(100) = \$750$ , which formula gives the correct fixed cost \$240?

- A)  $[C'(x)]_0^{100}$  E)  $C'(100) - [C(x)]_0^{100}$   
B)  $\int_0^{100} C'(x) dx$  F)  $C(100) - 100C'(100)$   
C)  $C'(0) + \int_0^{100} C'(x) dx$  G)  $750 - \int_0^{100} C'(x) dx$   
D) all of the above H) none of the above

Answer=\_\_\_\_\_

2 4. Find the value of the integral  $\int_0^1 \frac{x}{x+1} dx$ .

A)  $\frac{1}{3}$

B)  $2 - \ln 2$

C) 1

D)  $\infty$

E)  $\frac{1}{2} \ln 2$

F)  $1 - \ln 2$

G) 0

H) does not exist

Answer=\_\_\_\_\_

2 5. Which one of the following is not true about the functions  $P'(t) = 100te^{-0.5t}$  and  $P(t) = 400 - 400e^{-0.5t} - 200te^{-0.5t}$ ?

A)  $\lim_{t \rightarrow \infty} P(t) = 400$

B)  $\int_0^{\infty} P'(t) dt = 400$

C)  $\lim_{t \rightarrow \infty} P'(t) = 0$

D)  $P(6) = P(5) + \int_5^6 P'(t) dt$

E)  $\frac{d}{dx} \int_0^5 P(t) dt = \frac{d}{dx} \int_5^0 P(t) dt$

F)  $\frac{d}{dx} \int_5^x P'(t) dt = P'(x)$

G)  $\frac{d}{dx} \int_0^x P'(t) dt = 0$  at  $x = 5$

H)  $\frac{d}{dx} \int_x^5 P'(t) dt = 0$  at  $x = 0$ .

Answer=\_\_\_\_\_

2 6. Evaluate the improper integral  $\int_1^{\infty} x^{-2} dx$ .

A)  $\frac{1}{4}$

B) 2

C)  $\frac{1}{2}$

D)  $\frac{1}{3}$

E) 1

F) 4

G) 3

H) Divergent

Answer=\_\_\_\_\_

- 2 7. Which one of the following functions is a solution of the differential equation  $\frac{dy}{dx} - 4xy = 0$  for all  $x > 0$ ?

A)  $y = e^{-4x}$

E)  $y = 4x$

B)  $y = e^{2x^2}$

F)  $y = 1$

C)  $y = e^{2x+C}$

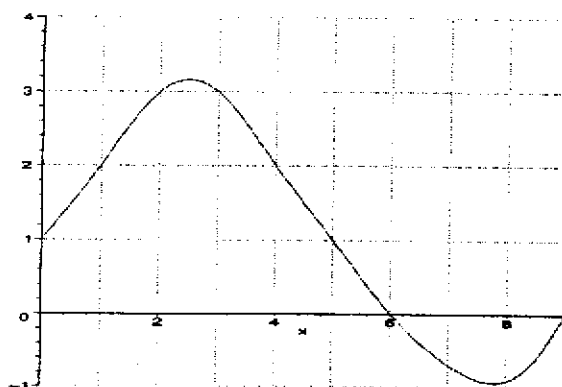
G)  $y = 2x^2$

D)  $y = \frac{1}{4x+1}$

H)  $y = e^{4x}$

Answer=\_\_\_\_\_

- 4 8. The graph of a function  $y = f(x)$  is given below:



Arrange in order from smallest to largest:

A)  $\int_0^9 f(x) dx$

D)  $\int_0^6 f(x) dx$

B)  $\int_6^9 f(x) dx$

E)  $f'(5)$

C)  $\int_0^5 f(x) dx$

Smallest = \_\_\_\_\_  
 2nd Smallest = \_\_\_\_\_  
 3rd Smallest = \_\_\_\_\_  
 4th Smallest = \_\_\_\_\_  
 Largest = \_\_\_\_\_

9. 10 points The demand function for a certain commodity is  $p = 5 - 0.1x$  dollars per unit, while the actual sales level is 30 units.

- 5 (a) Evaluate the consumers' surplus (in dollars) as an integral.
- 5 (b) Illustrate by graphing the demand curve and identifying the consumers' surplus as an area.

- [6] 10. (a) Give a step-by-step derivation of the Integration by Parts formula, starting with the Product Rule for the derivative  $\frac{d}{dx}[u v]$ . If you prefer, you may use the form  $\frac{d}{dx}[f(x)G(x)]$ .

6 (b) Evaluate

$$\int [\ln x]^2 dx.$$

Show your work. Hint: You may use the result:

$$\int \ln x dx = x \ln x - x + C.$$