

**MATH 152**

**Spring 1995**

**Exam II**

**Test Form B**

**NAME**

**ID#**

**INSTRUCTOR'S NAME**

**SECTION #**

**INSTRUCTIONS**

1. In Part I (problems 1 – 11), mark the correct choice on your SCANTRON sheet using a #2 pencil. Use the back of each page for scratch work. For your own records, record your responses on your exam (which will be returned to you). The SCANTRON will be collected after 1 hour and will not be returned.
2. In Part II (problems 12 – 16), write all solutions in the space provided. Use the back of each page for scratch work, but all work to be graded must be shown in the space provided. **CLEARLY INDICATE YOUR FINAL ANSWER.**

**MATH 152, Spring 1995, Exam II, Test Form B**

**Part I. MULTIPLE CHOICE, NO PART CREDIT, NO CALCULATORS**

The SCANTRON forms will be collected at the end of 1 hour. (6 points each)

1.  $\int_0^\infty e^{-2x} dx$  is
- (a)  $1/2$                       (b)  $-(1/2)$                       (c)  $1$                       (d)  $2$                       (e) divergent

2.  $\sum_{n=1}^{\infty} \left(\frac{1}{5}\right)^{n-1} =$
- (a)  $1/4$                       (b)  $5/4$                       (c)  $6/5$                       (d)  $5/6$                       (e)  $\infty$

3. A tank of sugar water contains 100 gal of water with 4 lb of dissolved sugar. Pure water enters the tank at the rate of 5 gal/min. The solution is kept thoroughly mixed and drains from the tank at the same rate. Let  $Q(t)$  denote the number of pounds of sugar in the tank at time  $t$ . Then  $Q(t)$  is determined by solving

- (a)  $Q'(t) = \frac{1}{20}Q(t)$ ,  $Q(0) = 4$                       (b)  $Q'(t) = -\frac{1}{25}Q(t)$ ,  $Q(0) = 5$   
(c)  $Q'(t) = -\frac{1}{20}Q(t)$ ,  $Q(0) = 4$                       (d)  $Q'(t) = 5 - \frac{1}{20}Q(t)$ ,  $Q(0) = 4$   
(e)  $Q'(t) = 4 + \frac{1}{25}Q(t)$ ,  $Q(0) = 5$

4. The average value of  $f(x) = x^2$  on the interval  $1 \leq x \leq 3$  is
- (a) 4                      (b) 8                      (c)  $13/2$                       (d)  $26/3$                       (e)  $13/3$

5.  $\lim_{n \rightarrow \infty} \frac{2n^2}{1+n^3}$  is

(a) 2                      (b) 0                      (c) divergent                      (d) 1                      (e)  $\infty$

6. Which plot shows the direction field of the differential equation  $\frac{dy}{dx} = y^2$  ?

(a)    (b)

(c)    (d)

(e)

7.  $\sum_{k=1}^{99} \left( \frac{1}{\sqrt{k}} - \frac{1}{\sqrt{k+1}} \right) =$

(a) 1.1                      (b) 1                      (c) .99                      (d) .9                      (e) diverges

8. Which sequence of Maple commands will evaluate the area of the surface generated by rotating the curve  $y = e^{2x}$  for  $0 \leq x \leq 1$ , about the  $x$ -axis?

- (a) `y:=exp(2*x); yprime:=diff(y,x);  
a:=Int(2*Pi*sqrt(1+yprime^2), x=0..1); value("");`
- (b) `y:=exp(2*x); yint:=int(y,x);  
a:=Int(2*Pi*sqrt(1+yint^2), x=0..1); value("");`
- (c) `y:=exp(2*x); yprime:=diff(y,x);  
a:=Int(2*Pi*y*sqrt(1+yprime), x=0..1); value("");`
- (d) `y:=exp(2*x); yprime:=diff(y,x);  
a:=Int(2*Pi*y*sqrt(1+yprime^2), x=0..1); value("");`
- (e) `y:=exp(2*x); yint:=int(y,x);  
a:=Int(sqrt(1+yint), x=0..1); value("");`

9.  $\int_0^1 \frac{1}{x^2} dx$  is

- (a)  $-1$
- (b) divergent
- (c)  $2$
- (d)  $1$
- (e)  $0$

10.  $\int_{-1}^1 \frac{1}{x^2} dx$  is

- (a)  $-2$
- (b) divergent
- (c)  $2$
- (d)  $1$
- (e)  $0$

11. Find an integrating factor for  $y' + xy = \sin x$ .

- (a)  $e^{(x^2/2)}$
- (b)  $\frac{x^2}{2}$
- (c)  $x$
- (d)  $e^x$
- (e)  $e^{-\cos x}$

**Part II. WORK OUT PROBLEMS,** PART CREDIT will be given.

CALCULATORS ARE PERMITTED after the SCANTRONS are collected.

Show all relevant steps in your solution. Clearly indicate your answer. Unsupported answers will not be given credit. Only work shown in the space provided will be graded.

12. (8 points) Find the  $x$ -coordinate of the centroid of the region bounded by  $y = x^2$  and  $y = \sqrt{x}$  from  $x = 0$  to  $x = 1$ .

13. (6 points) The end of a water tank is vertical and is a semicircle of radius 12 m. Find the hydrostatic force against the end of the tank if the tank is full. (The density of water is  $\rho = 1000 \text{ kg/m}^3$  .)

14. (5 points) Find the value of  $r$  for which

$$5 + 5r + 5r^2 + 5r^3 + 5r^4 + \cdots = 3 .$$

15. (8 points) Find the function  $y(x)$  that solves  $y'(x) = \frac{x}{y}$  and  $y(0) = 2$ .

16. (7 points) Determine the arc length of  $y(x) = \frac{4}{3}x^{3/2}$  from  $x = 0$  to  $x = 2$ .