

Name:

Show all work. Calculators are allowed.

Time it took to take test:

1. Let  $f(x) = \frac{x-1}{x+1}$  for all  $x \neq -1$ . Then

$f'(1)$  equals?

- A. -1
- B.  $-\frac{1}{2}$
- C. 0
- D.  $\frac{1}{2}$

2. The indefinite integral below equals?

$$\int 4x^3 e^{x^4} dx$$

- A.  $e^{4x^3} + C$
- B.  $e^{x^4} + C$
- C.  $4x^3 e^{x^4} + C$
- D. None of these

3. The value of  $\lim_{x \rightarrow \pi} \frac{\sin x - \sin \pi}{x - \pi}$  is?

- A. 0
- B.  $\frac{1}{2}$
- C. -1
- D. 1

4. The area of the region between the graph of  $y=3x^2-2x$  and the x-axis from  $x=0.75$  to  $x=2.25$  is best approximated by?

- A. 15.469
- B. 10.688
- C. 5.344
- D. 6.469

5. Which of the following equals

$$\frac{d}{dx}(\tan x + \sec x)$$

- A.  $\sec x + \tan x$
- B.  $(\sec x)(1 + \tan x)$
- C.  $(\sec x)(1 + \sec x)$
- D.  $(\sec x)(\sec x + \tan x)$

6. Find the coordinates of any points of inflection

of the graph of  $f(x) = x^3 - x^2 + \frac{1}{3}$ .

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7. Determine the domain of the function below.

$$f(x) = \frac{\sqrt{x-5}}{x}$$

8. Find  $y'$  given:

$$y = (x^3 + 1)^{15} \cos(x^2 - 3)$$

9. Evaluate:

$$\lim_{n \rightarrow \infty} \frac{1 + 3n^2}{n^2 + 1000}$$

10. Find  $y'$  given:

$$y = e^{\tan x} + 1$$

11. Suppose  $g$  is a function such that  $g'(1) = 0$ ,  $g'(x) > 0$  when  $x$  lies in the interval  $(-1, 1)$  and  $g'(x) < 0$  when  $x$  lies in the interval  $(1, 3)$ . Sketch the graph of  $g$  for values of  $x$  near  $x=1$ . Indicate any special characteristics of  $g$  at  $x=1$ .

12. Let  $y = \cos(\cos^2 x)$ . Find  $\frac{dy}{dx}$ .

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13. The area of the region bounded by the graphs of  $f(x) = 2 - x^2$  and  $g(x) = x$  is?

- A.  $\frac{9}{2}$   
 B.  $\frac{27}{16}$   
 C.  $\frac{1}{2}$   
 D.  $\frac{11}{2}$

14. Approximate the area of the region bounded by the graph of  $y = xe^{-x}$  and the x-axis over the interval is  $[-0.7, 2.4]$ .

15. Which of the following properties of the definite integral is/are true?

I.  $\int_a^b xf(x)dx = x \int_a^b f(x)dx$

II.  $\int_a^c f(x)dx + \int_c^b f(x)dx = \int_a^b f(x)dx$

III.  $\int_a^b kf(x)dx = k \int_a^b f(x)dx$

where  $k$  is a constant

- A. III only      C. II and III  
 B. I only      D. I, II, and III

16. Let  $f(x) = x^9 + 10$ . Find  $f^{-1}(x)$ .

17. Approximate the slope of the line tangent to the ellipse  $\frac{x^2}{9} + \frac{y^2}{16} = 1$  at the point  $\left(1, -\frac{8\sqrt{2}}{3}\right)$ .

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18. Integrate:

$$\int x^2 e^{x^3} dx$$

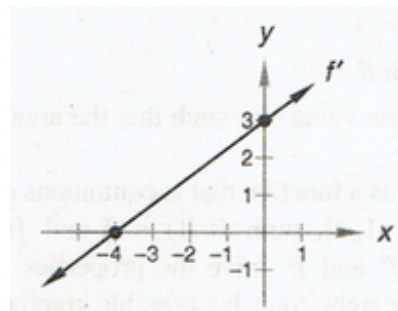
A.  $\frac{1}{3} e^{x^3} + C$

B.  $3e^{x^3} + C$

C.  $\frac{1}{3}(x^3 + e^{x^3} + C)$

D.  $e^{x^3}(3x^4 + 2x) + C$

20. The graph of the derivative of  $f$  is shown below. Sketch the graph of  $f$ .



19. Let  $g(x) = x^3 + 6x + 10$ .

a) State the interval(s) over which  $g$  is increasing.

b) State the interval(s) over which  $g$  is concave down.

