

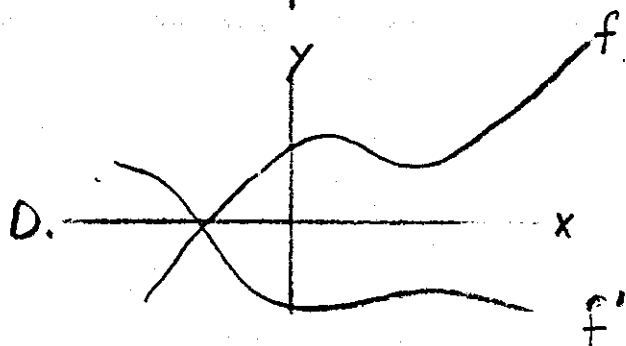
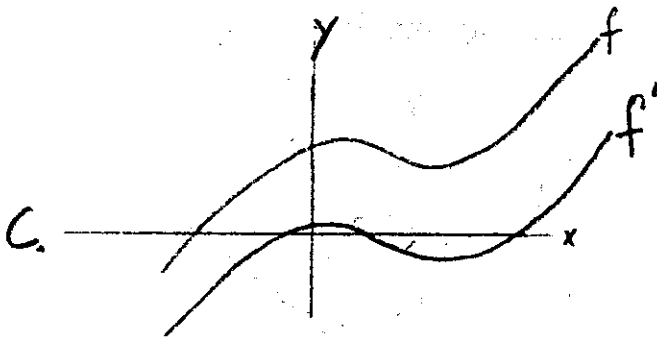
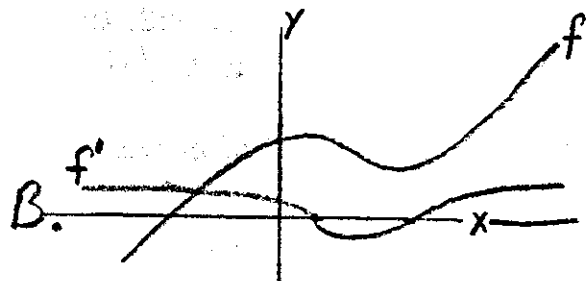
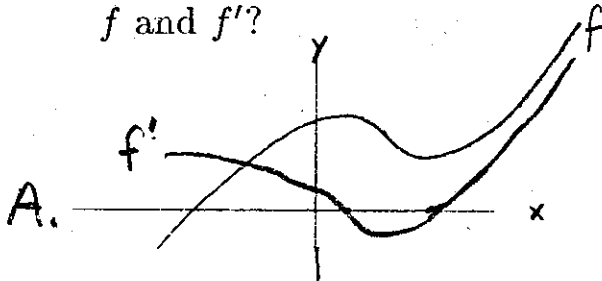
Topic Test

Calculus

1. If $g(x) = x^2 + x + 1$, then $g'(x) =$
- A. $x + 1$ B. $2x + 1$
- D. $\frac{x^3}{3} + \frac{x^2}{2} + x$ E. $\frac{x^3}{3} + \frac{x^2}{2} + x + 1$

C. $x^3 + x^2 + x + 1$

2. Which of the following sketches could be an accurate representation of f and f' ?



3. If $f(x) = \frac{3x + 8}{2x^2 - 9x + 1}$, then $f'(x) =$
- A. $\frac{3x}{4x-9}$ B. $\frac{(3x + 8)(4x - 9) - (2x^2 - 9x + 1)3}{(2x^2 - 9x + 1)^2}$
- C. $3(2x^2 - 9x + 1)^{-1} - (3x + 8)(2x^2 - 9x + 1)^{-2}(4x - 9)$
- D. $\frac{(2x^2 - 9x + 1)(3x + 8) - (4x - 9)3}{(2x^2 - 9x + 1)^2}$
- E. None of these

Problems 4, 5, 6 all refer to the following table.

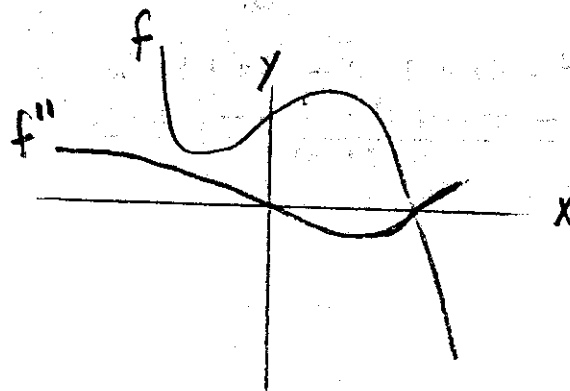
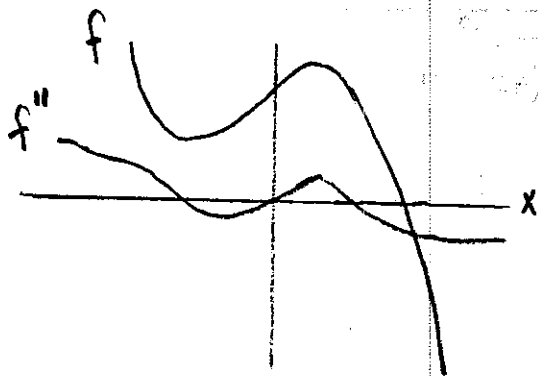
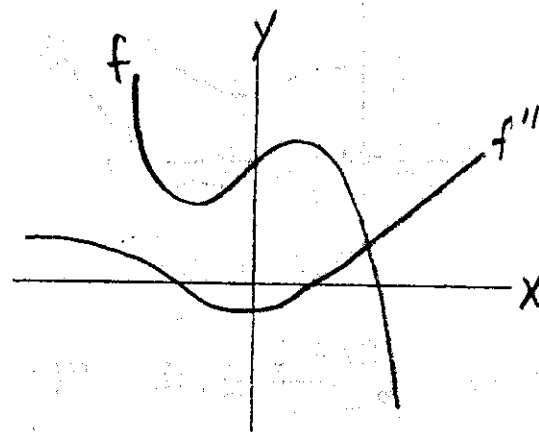
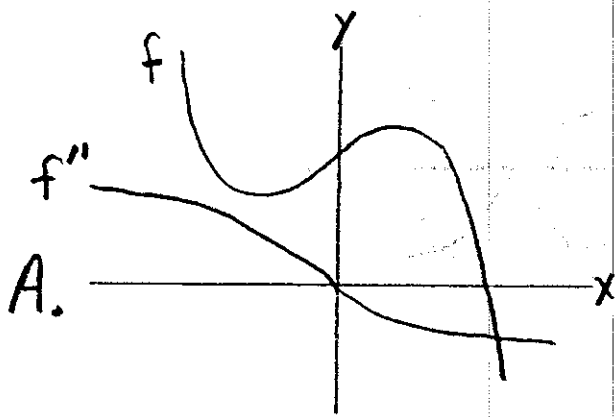
x	0	1	2	3	4
$f(x)$	2	3	6	9	11
$g(x)$	13	12	8	7	5
$f'(x)$	1	2	3	-2	4
$g'(x)$	-2	-1	$-\frac{1}{2}$	$\frac{1}{2}$	-2

4. Find the derivative of $f(x)g(x)$ at $x = 0$.
- A. 9 B. -9 C. 24
 D. -24 E. -2

5. Find the derivative of $f(x)/g(x)$ at $x = 3$.
- A. $37/98$ B. $-62/49$ C. $64/49$
 D. $-37/98$ E. $62/49$

6. Find the derivative of $g(f(x))$ at $x = 1$.
- A. -2 B. -1 C. 0
 D. 1 E. 2

7. Which of the following sketches could be correctly labelled?



8. The function $y = xe^x$ satisfies which of the following equations?
 A. $y'' + 2y' + y = 0$ B. $y'' + y' - 2y = 0$ C. $y'' - 2y' - y = 0$
 D. $-y'' + 2y' + y = 0$ E. $y'' - 2y' + y = 0$

9. Given that $I = \int_{-1}^1 \sqrt{1+x^4}$, which of the following statements are true?

i. $I < 1 + \sqrt{17/16}$

ii. $I < 2 + \sqrt{17/16}$

iii. $I < \sqrt{17/16} + \sqrt{2}$

- A. All B. i and ii C. ii and iii
 D. ii only E. iii only

10. Find $\frac{d}{dx} \int_a^x e^{-t^2} \sin t dt$

A. $\int_a^x -2te^{-t^2} \sin t + e^{-t^2} \cos t dt$

B. $\int_a^x e^{-x^2} \sin x dx$

C. $e^{-t^2} \sin t$

D. $e^{-x^2} \sin x$

E. None of these

11. Find the area enclosed by the $y = x$ and $y = x^3$ curves.

- A. $1/4$ B. $1/3$ C. $1/2$
 D. $2/3$ E. None of these

12. Find $\lim_{n \rightarrow \infty} \frac{1}{n} \left(\frac{1}{\sqrt{n}} + \sqrt{\frac{2}{n}} + \sqrt{\frac{3}{n}} + \dots + 1 \right)$

- A. $1/4$ B. $1/3$ C. $1/2$
 D. $2/3$ E. None of these

13. Find the maximum value of xe^{-x^2} .

- A. $1/\sqrt{e}$ B. $1/\sqrt{2}$ C. $1/\sqrt{2e}$
 D. $\sqrt{2/e}$ E. None of these

14. The slope of the graph of $xy^2 + 3xy = (x+y)^3 - 44$ at $(2, 2)$ is

- A. $1/4$ B. $1/3$ C. $1/2$
 D. $2/3$ E. None of these

15. Evaluate $\int_1^2 \sec^{-1} x dx$

- A. 2π B. $2\pi/3$ C. $2(\pi/3 + \ln 2)$
D. $2\pi/3 - \ln(2 + \sqrt{3})$ E. $2\pi/3 - \ln(\sqrt{3}/2)$

16. If the region bounded by the graph of $y = x(1 - x)$ and the x -axis is rotated around the y -axis, the resulting volume is

- A. $\pi/3$ B. $\pi/4$ C. $\pi/6$
D. $\pi/8$ E. $\pi/12$

17. If S_n is the n^{th} Simpson's Rule approximation to $\int_0^1 e^{-x^2} dx$ then what least value of n should be chosen in order to guarantee an error of less than 0.0001?

- A. 6 B. 10 C. 16
D. 20 E. 100

18. Find the arclength of the curve $y^3 = x^2$ from the point (0,0) to the point (1,1).

- A. $\sqrt{3}$ B. $8(\sqrt{13} - 1)/27$ C. $(10\sqrt{13} - 8)/16$
D. $\pi/2$ E. $(13\sqrt{13} - 8)/27$

19. Find the centroid (center of mass) of the region bounded by the curves $y = x$ and $y = x^2$.

- A. $(1/2, 1/2)$ B. $(1/3, 1/5)$ C. $(1/2, 2/5)$
D. $(1/2, 1/3)$ E. $(2/5, 1/3)$

20. If at time t , an ant's position (x, y) is given by $x = t^2$ and $y = t^3 - t$, then the ant's path encloses a loop. The area of this loop is

- A. π B. $\pi/4$ C. $9/16$
D. $8/15$ E. $1/2$