Name: ______________________________________ Period: ____

Directions: Select the best response to each problem below. Items marked NC are not permitted a calculator to answer the problem and those marked C may require the use of a calculator to solve the problem.

1. _____ NC '08 #3

If $f(x)=(x-1)(x^2+2)^3$, then $f'(x)=$

(A) $6x(x^2+2)^2$

(B) $6x(x-1)(x^2+2)^2$

(C) $(x^2+2)^2(x^2+3x-1)$

(D) $(x^2+2)^2(7x^2-6x+2)$

(E) $-3(x-1)(x^2+2)^2$

2. _____ NC '08 #6

$$f(x)=\begin{cases}\dfrac{x^2-4}{x-2} & \text{if } x\neq 2\\ 1 & \text{if } x=2\end{cases}$$

Let *f* be the function defined above. Which of the following statements about *f* are true?

I. f has a limit at $x = 2$.
II. f is continuous at $x = 2$.
III. f is differentiable at $x = 2$.

(A) I only (B) II only (C) III only (D) I and II only (E) I, II, and III

3. _____ NC '08 #24

The function *f* is twice differentiable with $f(2)=1$, $f'(2)=4$, and $f''(2)=3$. What is the value of the approximation of $f(1.9)$ using the line tangent to the graph of *f* at $x = 2$?

(A) 0.4 (B) 0.6 (C) 0.7 (D) 1.3 (E) 1.4

4. _____ NC '08 #25

$$f(x)=\begin{cases}cx+d & \text{for } x\le 2\\ x^2-cx & \text{for } x>2\end{cases}$$

Let f be the function defined above, where c and d are constants. If f is differentiable at $x = 2$, what is the value of $c + d$?

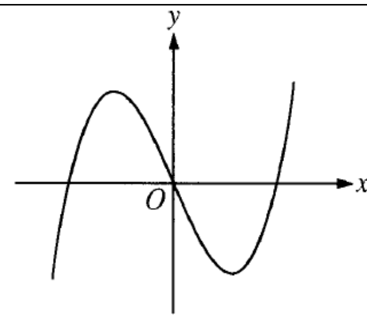
(A) –4 (B) –2 (C) 0 (D) 2 (E) 4

5. _____ C '08 #78

The first derivative of the function f is defined by $f'(x)=\sin(x^3-x)$ for $0\le x\le 2$. On what intervals is f increasing?

(A) $1\le x\le 1.445$ only
(B) $1\le x\le 1.691$
(C) $1.445\le x\le 1.875$
(D) $0.577\le x\le 1.445$ and $1.875\le x\le 2$
(E) $0\le x\le 1$ and $1.691\le x\le 2$

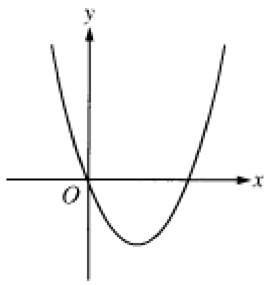
6. _____ NC ’08 #11



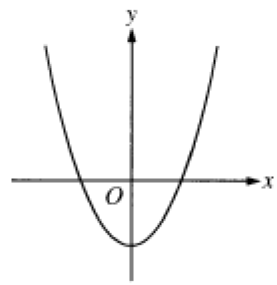
Graph of f

The graph of a function f is shown above. Which of the following could be the graph of f', the derivative of f?

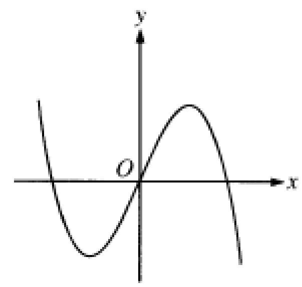
(A)



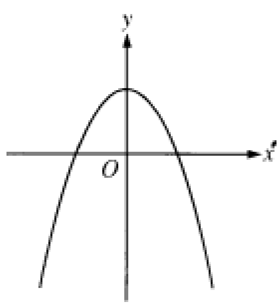
(B)



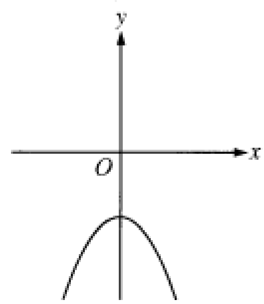
(C)



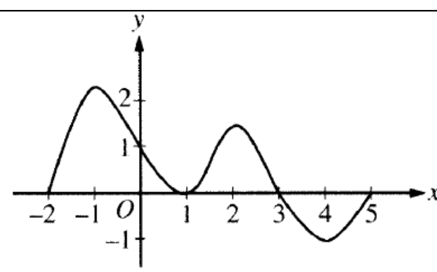
(D)



(E)



7. _____ C ’08 #76



Graph of f'

The graph of f', the derivative of f, is shown above for $-2 \le x \le 5$. On what intervals is f increasing?

(A) [–2,1] only
(B) [–2,3]
(C) [3,5] only
(D) [0,1.5] and [3,5]
(E) [–2, –1], [1,2], and [4,5]

8. _____ NC ’03 #1

If $y = \left(x^3 + 1\right)^2$, then $\frac{dy}{dx} =$

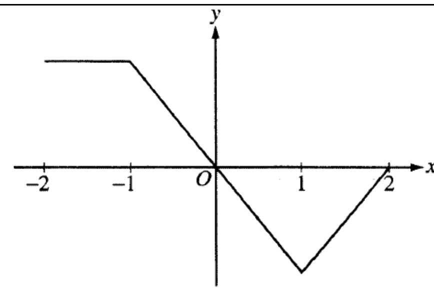
(A) $\left(3x^2\right)^2$ (B) $2\left(x^3 + 1\right)$ (C) $2\left(3x^2 + 1\right)$ (D) $3x^2\left(x^3 + 1\right)$ (E) $6x^2\left(x^3 + 1\right)$

9. _____ NC ’03 #4

If $y=\dfrac{2x+3}{3x+2}$, then $\dfrac{dy}{dx}=$

(A) $\dfrac{12x+13}{(3x+2)^2}$ (B) $\dfrac{12x-13}{(3x+2)^2}$ (C) $\dfrac{5}{(3x+2)^2}$ (D) $\dfrac{-5}{(3x+2)^2}$ (E) $\dfrac{2}{3}$

10. ____ NC ’03 #7

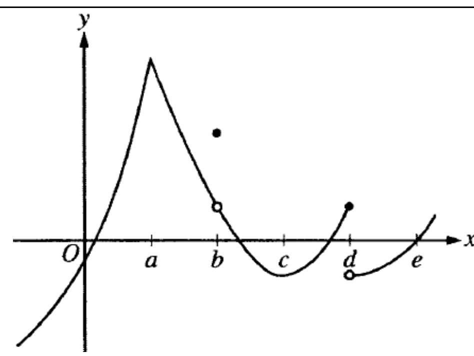


Graph of f'

The graph of f', the derivative of the function *f*, is shown above. Which of the following statements is true about *f* ?

(A) *f* is decreasing for $-1\le x\le 1$
(B) *f* is increasing for $-2\le x\le 0$
(C) *f* is increasing for $1\le x\le 2$
(D) *f* has a local minimum at $x=0$
(E) *f* is not differentiable at $x=-1$ and $x=1$

11. ____ NC ’03 #13



Graph of *f*

The graph of a function *f* is shown above. At which value of *x* is *f* continuous, but not differentiable?

(A) *a* (B) *b* (C) *c* (D) *d* (E) *e*

12. ____ NC ’03 #14

If $y=x^2\sin 2x$, then $\dfrac{dy}{dx}=$

(A) $2x\cos 2x$
(B) $4x\cos 2x$
(C) $2x(\sin 2x+\cos 2x)$
(D) $2x(\sin 2x-x\cos 2x)$
(E) $2x(\sin 2x+x\cos 2x)$

13. ____ NC '03 #15

Let f be the function with derivative given by $f'(x) = x^2 - \frac{2}{x}$. On which of the following intervals is f decreasing?

(A) $(-\infty, -1]$ only

(B) $(-\infty, 0)$

(C) $[-1, 0)$ only

(D) $(0, \sqrt[3]{2}]$

(E) $[\sqrt[3]{2}, \infty)$

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14. ____ NC '03 #16

If the line tangent to the graph of the function f at the point (1, 7) passes through the point (–2, –2), then $f'(1)$ is

(A) –5 (B) 1 (C) 3 (D) 7 (E) undefined

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15. ____ NC '03 #18

x	–4	–3	–2	–1	0	1	2	3	4
$g'(x)$	2	3	0	–3	–2	–1	0	3	2

The derivative g' of a function g is continuous and has exactly two zeros. Selected values of g' are given in the table above. If the domain of g is the set of all real numbers, then g is decreasing on which of the following intervals?

(A) $-2 \le x \le 2$ only

(B) $-1 \le x \le 1$ only

(C) $x \ge -2$

(D) $x \ge 2$ only

(E) $x \le -2$ or $x \ge 2$

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16. ____ NC '03 #20

$$f(x) = \begin{cases} x + 2 & \text{if } x \le 3 \\ 4x - 7 & \text{if } x > 3 \end{cases}$$

Let f be the function given above. Which of the following statements are true about f?

I. $\lim_{x \to 3} f(x)$ exists.

II. f is continuous at $x = 3$.

III. f is differentiable at $x = 3$.

(A) None (B) I only (C) II only (D) I and II only (E) I, II, and III

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17. ____ NC '03 #24

Let f be the function defined by $f(x) = 4x^3 - 5x + 3$. Which of the following is an equation of the line tangent to the graph of f at the point where $x = -1$?

(A) $y = 7x - 3$

(B) $y = 7x + 7$

(C) $y = 7x + 11$

(D) $y = -5x - 1$

(E) $y = -5x - 5$

18. ____	C '03 #81	Let f be the function with derivative given by $f'(x)=\sin(x^2+1)$. How many relative extrema does f have on the interval $2 < x < 4$? (A) One (B) Two (C) Three (D) Four (E) Five
19. ____	C '03 #89	Let f be a differentiable function with $f(2)=3$ and $f'(2)=-5$, and let g be the function defined by $g(x)=xf(x)$. Which of the following is an equation of the line tangent to the graph of g at the point where $x=2$? (A) $y=3x$ (B) $y-3=-5(x-2)$ (C) $y-6=-5(x-2)$ (D) $y-6=-7(x-2)$ (E) $y-6=-10(x-2)$