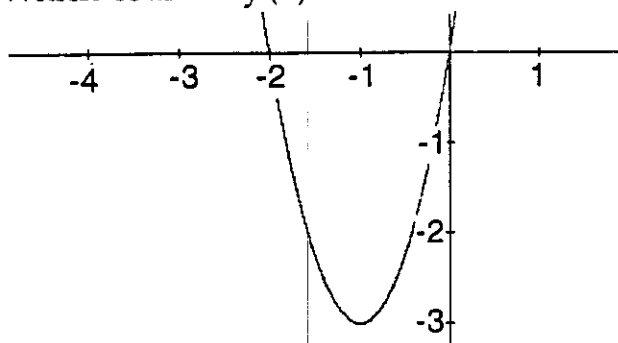


Multiple Choice. On each question answer E if NOTA, None of the above.

- 1) Below is the graph of $f'(x)$, the derivative of a function $f(x)$. Which could be $f(x)$?



- A) $f(x) = \frac{1}{3}x^3 + \frac{3}{2}x^2 - 4$ B) $f(x) = 3x^2 + 6x$
 C) $f(x) = x^2 + 2x$ D) $f(x) = x^3 + 3x^2 - 4$
- 2) Find $\lim_{x \rightarrow \frac{\pi}{4}} \frac{\sin^2 x - \sin^2 \frac{\pi}{4}}{x - \frac{\pi}{4}}$
- A) 1 B) 0
 C) $\pi / 4$ D) $\pi / 2$
- 3) Find the domain of the real-valued function $f(x) = \frac{\sqrt{x^2 - 1}}{x^2 - 4}$
- A) $(-\infty, -2) \cup (-2, -1] \cup [1, 2) \cup (2, \infty)$
 B) $(-\infty, -1] \cup [1, \infty)$
 C) $(-\infty, 2) \cup (-2, 2) \cup (2, \infty)$
 D) $(-\infty, \infty)$
- 4) Use two iterations of Newton's Method, starting with $x_0 = 1$, to find the root of the function $f(x) = x^2 - 2$ correct to three decimal places.
- A) 1.5 B) 1.417
 C) 1.410 D) 1.414

5) What is the smallest value of x that satisfies the relation $y^3 - 3y^2 = 2x$ when $y > 0$?

- A) 2
C) $-4/3$
- B) -2
D) $4/3$

6) Let $h(x) = f(x)g(x)$, and let

$$h(2) = -1$$

$$f(2) = 2$$

$$g(2) = 3$$

$$h'(2) = 4$$

$$f'(2) = 1$$

Find $g'(2)$.

- A) -2
C) $7/2$
- B) 4
D) $1/2$

7) Find $\lim_{x \rightarrow 2} \frac{x-2}{\sqrt{x^2-2x}}$

- A) 1
C) $\sqrt{2}$
- B) 0
D) ∞

8) Which modification to $f(x) = |x|$ will make this function continuous and first-order differentiable for all real numbers?

- A) on $x \in \left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$, $f(x) = -\sqrt{\frac{1}{2} - x^2} + 1$
- B) on $x \in (-1, 1)$, $f(x) = 1$
- C) on $x \in (-1, 1)$, $f(x) = \frac{1}{2}x^2 + \frac{1}{2}$
- D) on $x \in \left(-\frac{1}{2}, \frac{1}{2}\right)$, $f(x) = \sqrt{\frac{1}{2} - x^2} + 1$

- 9) Let $f(x) = \lim_{a \rightarrow 0} \frac{\sqrt[3]{x+a} - \sqrt[3]{x}}{a}$. Find $f(0)$.
- A) Does Not Exist B) 0
C) 1 D) $-\infty$
- 10) Which statement is true about the function $f(x) = \frac{-1}{x^2}$?
- A) $f(x)$ is concave up on the region $(-\infty, \infty)$
B) $f(x)$ is concave down on the region $(-\infty, \infty)$
C) $f(x)$ is concave up on the region $(0, \infty)$
D) $f(x)$ is concave down on the region $(-\infty, 0)$
- 11) Let $f(x)$ be an even function and $g(x)$ be an odd one, both differentiable and everywhere defined. Which of the following functions is odd?
- A) $g'(x)f(x)$ B) $f'(x)g(x)$
C) $f(g(x))$ D) $D_x[f(g(x))]$
- 12) Find $\lim_{h \rightarrow 0} \frac{4 - \sqrt{h+16}}{4h}$
- A) $-1/32$ B) $-1/16$
C) $-1/2$ D) $-1/8$
- 13) Find the value of x where the slope of the curve $f(x) = \sqrt{x}$ equals its average rate of change on the interval $[1, 9]$.
- A) $1/4$ B) $2\sqrt{2}$
C) $1/2\sqrt{2}$ D) 4
- 14) What is the minimum value of $f(x) = x^3 + 2x^2 + x + 3$ on the interval $[-2, 2]$?
- A) 2 B) $7/3$
C) $77/27$ D) 3

15) Given that $h(x) = f(g(x))$ and also given $g(1) = 2$ $f(1) = 2$ find $\frac{h'(1)}{g'(1)}$.
 $g'(2) = 3$ $f'(2) = 5$

A) $\frac{2}{3}$

B) $\frac{5}{2}$

C) 2

D) 5

16) To make the function $f(x) = \frac{x-1}{x^3-3x+2}$ continuous at $x=1$,
 $f(1)$ must have what value?

A) 2

B) -2

C) 1

D) -1

17) A jet at time 0 is coasting at 5 ft/s down a runway and is 100 ft from the end of the runway behind it. At time 10 sec. it applies an acceleration of 40 ft/s². What is its position from the end of the runway at time $t > 10$?

A) $s = 20(t-10)^2 + 5(t-10) + 150$

B) $s = 20(t-10)^2 + 5(t-10) + 100$

C) $s = 20t^2 + 5t + 100$

D) $s = 20t^2 + 5t + 150$

18) The equation of the line through (2,2) tangent to the curve $y^2 = 2x$ is...

A) $y = \frac{1}{2}x - 3$

B) $y = 2x + 1$

C) $y = \frac{1}{2}x + 1$

D) $y = -2x + 1$

19) If $f(x) = \int_0^x \frac{1}{a^3+3} da$ then what is $f'(-1)$?

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

B) $\frac{-1}{2}$

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

D) Undefined

25) What is the slope of the inverse of $f(x) = x^3 + x + 1$ when $x = 11$?

A) $\frac{1}{364}$

B) $\frac{-1}{364}$

C) $\frac{-1}{13}$

D) $\frac{1}{13}$

26) Find $\frac{dy}{dx}$ if $\cot(x - y) = -x$.

A) $\frac{dy}{dx} = 1 - \csc^2(x - y)$

B) $\frac{dy}{dx} = \sin^2(x - y) + 1$

C) $\frac{dy}{dx} = \cos^2(x - y)$

D) $\frac{dy}{dx} = \sin^2(x - y)$

27) Find the equation of the tangent line to the curve $y = \frac{x+1}{x-1}$ at $x = 2$.

A) $y = -x + 7$

B) $y = -2x + 7$

C) $y = -x + 5$

D) $y = -2x + 5$

28) What is the area between the curve $y = -x^2 - 2x + 3$ and the x -axis on the interval $[-3, 2]$?

A) 13

B) $\frac{25}{3}$

C) -5

D) 5

29) Find all point(s) of inflection of the function $f(x) = 0.3x^5 - x^4 + x^3 + 0.7x + 1$.

A) (1,2)

B) (0,1)

C) (0,1) and (1,2)

D) (1,2) and (1,-2)

30) If $f(x) = \frac{1}{x-1}$ and $g(x) = x^2 - 1$, then let $h(x) = f(x)g(x)$.
Find $h'(1)$.

A) Undefined

B) 0

C) ∞

D) 1