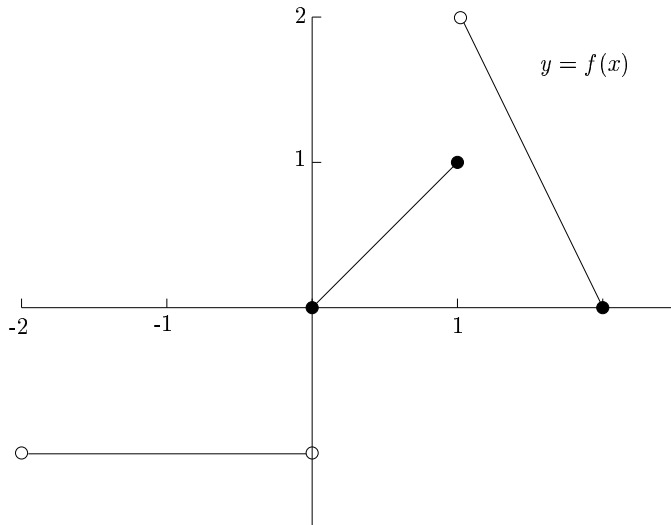


### Math 110 Test # 2

Fill in the bubbles that correspond to the correct answers. No aids: no calculators, closed book. You are not permitted to consult with your fellow students in any way. Time: 60 minutes.



The following 16 questions refer to the above figure, which is the graph of a function called  $f$ .

Question 1. The value of  $f(0)$  is

- (A) 2                      (B)  $\frac{3}{2}$                       (C) 1                      (D)  $\frac{1}{2}$                       (E) 0  
 (F)  $-\frac{1}{2}$                       (G) -1                      (H) does not exist

Question 2. The value of  $f(\frac{1}{2})$  is

- (A) 2                      (B)  $\frac{3}{2}$                       (C) 1                      (D)  $\frac{1}{2}$                       (E) 0  
 (F)  $-\frac{1}{2}$                       (G) -1                      (H) does not exist

Question 3. The value of  $f(1)$  is

- (A) 2                      (B)  $\frac{3}{2}$                       (C) 1                      (D)  $\frac{1}{2}$                       (E) 0  
 (F)  $-\frac{1}{2}$                       (G) -1                      (H) does not exist

Question 4. The value of  $\lim_{x \rightarrow 0^-} f(x)$  is

- (A) 2                      (B)  $\frac{3}{2}$                       (C) 1                      (D)  $\frac{1}{2}$                       (E) 0  
 (F)  $-\frac{1}{2}$                       (G) -1                      (H) does not exist

Question 5. The value of  $\lim_{x \rightarrow 0^+} f(x)$  is

- (A) 2                      (B)  $\frac{3}{2}$                       (C) 1                      (D)  $\frac{1}{2}$                       (E) 0  
 (F)  $-\frac{1}{2}$                       (G) -1                      (H) does not exist

Question 6. The value of  $\lim_{x \rightarrow 0} f(x)$  is

- (A) 2                      (B)  $\frac{3}{2}$                       (C) 1                      (D)  $\frac{1}{2}$                       (E) 0  
 (F)  $-\frac{1}{2}$                       (G) -1                      (H) does not exist

Question 7. The value of  $\lim_{x \rightarrow 1^-} f(x)$  is

- (A) 2                      (B)  $\frac{3}{2}$                       (C) 1                      (D)  $\frac{1}{2}$                       (E) 0  
 (F)  $-\frac{1}{2}$                       (G) -1                      (H) does not exist

Question 8. The value of  $\lim_{x \rightarrow 1^+} f(x)$  is

- (A) 2 (B)  $\frac{3}{2}$  (C) 1 (D)  $\frac{1}{2}$  (E) 0  
(F)  $-\frac{1}{2}$  (G)  $-1$  (H) does not exist

Question 9. The value of  $\lim_{x \rightarrow 1} f(x)$  is

- (A) 2 (B)  $\frac{3}{2}$  (C) 1 (D)  $\frac{1}{2}$  (E) 0  
(F)  $-\frac{1}{2}$  (G)  $-1$  (H) does not exist

Question 10. The value of  $\lim_{x \rightarrow \frac{3}{2}^-} f(x)$  is

- (A) 2 (B)  $\frac{3}{2}$  (C) 1 (D)  $\frac{1}{2}$  (E) 0  
(F)  $-\frac{1}{2}$  (G)  $-1$  (H) does not exist

Question 11. The value of  $\lim_{x \rightarrow \frac{3}{2}^+} f(x)$  is

- (A) 2 (B)  $\frac{3}{2}$  (C) 1 (D)  $\frac{1}{2}$  (E) 0  
(F)  $-\frac{1}{2}$  (G)  $-1$  (H) does not exist

Question 12. The value of  $\lim_{x \rightarrow \frac{3}{2}} f(x)$  is

- (A) 2 (B)  $\frac{3}{2}$  (C) 1 (D)  $\frac{1}{2}$  (E) 0  
(F)  $-\frac{1}{2}$  (G)  $-1$  (H) does not exist

Question 13. The value of  $\lim_{x \rightarrow -2^+} f(x)$  is

- (A) 2 (B)  $\frac{3}{2}$  (C) 1 (D)  $\frac{1}{2}$  (E) 0  
(F)  $-\frac{1}{2}$  (G)  $-1$  (H) does not exist

Question 14. The value of  $\lim_{x \rightarrow -2^-} f(x)$  is

- (A) 2 (B)  $\frac{3}{2}$  (C) 1 (D)  $\frac{1}{2}$  (E) 0  
(F)  $-\frac{1}{2}$  (G)  $-1$  (H) does not exist

Question 15. The range of the function  $f$  is

- (A)  $(-2, 2)$  (B)  $(0, 2]$  (C)  $[0, 2)$  (D)  $(0, 2) \cup \{-1\}$  (E)  $\{-1\}$   
(F)  $[-2, 2] \setminus \{1\}$  (G)  $[-1, 2)$  (H)  $[0, 2) \cup \{-1\}$

Question 16. The domain of the function  $f$  is

- (A)  $[-2, 2) \setminus \{0, 1\}$  (B)  $[-2, 2]$  (C)  $[-2, 2] \setminus \{1\}$  (D)  $[-2, 2)$  (E)  $[-2, 2] \setminus \{0\}$   
(F)  $(-2, 2]$  (G)  $(-2, 2) \setminus \{0, 1\}$  (H)  $(-2, 2)$

Question 17. The complete list of vertical asymptotes of the function  $f(x) = \frac{x^2}{x^2 - x - 2}$  is

- (A)  $x = -1, x = 2$  (B)  $x = 2$  (C)  $x = -1$  (D)  $y = 2, y = 3$  (E)  $x = 0$   
(F)  $y = -1, y = 2$  (G)  $x = -1, x = -2$  (H)  $x = 0, y = 1$

In the next four problems you are asked to evaluate limits

Question 18.  $\lim_{x \rightarrow -1} \frac{|x|}{x}$

- (A)  $\infty$  (B) 1 (C) 0 (D)  $-2$  (E) does not exist  
(F)  $-1$  (G)  $-\infty$  (H)  $\pi$

Question 19.  $\lim_{x \rightarrow 1} \frac{x^3 - 1}{x^2 - 1}$

- (A)  $\frac{3}{2}$                       (B)  $\frac{11}{3}$                       (C)  $\frac{7}{12}$                       (D)  $\frac{1}{3}$                       (E)  $-\frac{11}{3}$   
(F) 0                              (G)  $-\frac{7}{12}$                       (H) 1

Question 20.  $\lim_{x \rightarrow 9} \frac{9-x}{3-\sqrt{x}}$

- (A) 3                              (B) 1                              (C)  $\frac{2}{3}$                               (D)  $-\frac{2}{3}$                               (E) 2  
(F) 0                              (G) 6                              (H) 4

Question 21.  $\lim_{h \rightarrow 0} \frac{(1+h)^2-1}{h}$

- (A) 0                              (B)  $\frac{1}{2}$                               (C)  $\frac{4}{3}$                               (D) 2                              (E) 1  
(F)  $-\frac{1}{2}$                               (G)  $h$                               (H)  $-2$

Question 22. The polynomial  $f(x) = x^3 - 4x^2 + 2$  has all its zeros in the interval  $(-5, 5)$ . How many zeros are there in the interval  $(-1, 1)$ ?

- (A) 2                              (B) 0                              (C) 1                              (D) 3                              (E) 4  
(F) 5                              (G) 6                              (H) 7

Question 23. For one value of the constant  $c$  chosen from the list below, the function

$$f(x) = \begin{cases} c \arctan x, & x \leq 1 \\ \frac{\pi}{c} \sqrt{x}, & x \geq 1 \end{cases}$$

is continuous. Which value?

- (A)  $-3$                               (B) 1                              (C)  $-2$                               (D)  $\pi$                               (E)  $\frac{1}{3}$   
(F)  $-\frac{1}{3}$                               (G)  $\frac{1}{2}$                               (H)  $-\frac{1}{2}$

The next 4 questions ask for limits at  $\pm\infty$ .

Question 24.  $\lim_{x \rightarrow \infty} \frac{\sin(\sqrt{x})}{\sqrt{x}}$

- (A)  $\sin(1)$                       (B) 1                              (C) does not exist                      (D)  $-1$                               (E)  $\frac{1}{2}$   
(F)  $\frac{1}{3} \log_5 2 + \frac{2}{3}$                       (G) 0                              (H)  $\frac{1}{\sqrt{5}} \log_2 5 + \frac{2}{3}$

Question 25.  $\lim_{x \rightarrow -\infty} \frac{x^3-3x^2+3x-1}{x^3+2x^2-x-2}$

- (A)  $-3$                               (B)  $-1$                               (C)  $-\frac{3}{2}$                               (D)  $\frac{3}{2}$                               (E)  $-\frac{1}{2}$   
(F)  $\frac{1}{2}$                               (G) 0                              (H) 1

Question 26.  $\lim_{x \rightarrow -\infty} \arctan(x + x^2)$

- (A)  $\frac{\pi}{2}$                       (B) 1                      (C)  $2\pi$                       (D)  $-2$                       (E)  $\infty$   
(F)  $-\infty$                       (G)  $3\pi$                       (H)  $-\frac{3}{2}\pi$

Question 27.  $\lim_{x \rightarrow \infty} \frac{\sqrt{x^2-9}}{2x-6}$

- (A)  $-\frac{1}{2}$                       (B) 1                      (C)  $-1$                       (D) 2                      (E)  $-2$   
(F)  $\frac{1}{2}$                       (G) 0                      (H)  $\frac{3}{2}$

Question 28. If the ball is thrown straight upward with initial velocity  $96 \text{ ft/sec}$ , then its height  $t$  seconds later is  $y(t) = 96t - 16t^2$  feet. Determine the maximal height the ball attains.

- (A)  $44 \text{ ft}$                       (B)  $128 \text{ ft}$                       (C)  $100 \text{ ft}$                       (D)  $0 \text{ ft}$                       (E)  $28 \text{ ft}$   
(F)  $126 \text{ ft}$                       (G)  $100 \text{ ft}$                       (H)  $144 \text{ ft}$

The next two questions refer  $f(x) = 2x^3 - 6x^2 - 3$  defined on  $[0, 2]$ .

Question 29. The slope of the secant line connecting the endpoints of the graph of  $f$  is

- (A)  $-2$     (B) 2  
(C) 1    (D)  $-1$   
(E)  $-\frac{1}{2}$     (F)  $\frac{1}{2}$   
(G)  $-4$     (H) 3

Question 30. The  $x$ -intercept of the tangent line to  $f$  at  $(1, -7)$  equals

- (A)  $\pi$     (B) 2  
(C) 1    (D)  $-1$   
(E)  $-\frac{1}{6}$     (F)  $\frac{1}{2}$   
(G) 0    (H)  $\frac{1}{3}$

Question 31. If  $y = \frac{x^2}{1+\sqrt{x}}$  then  $y'$  at  $x = 1$  is

- (A) 2                      (B) 0                      (C)  $-1$                       (D)  $\frac{1}{3}$                       (E)  $\frac{1}{4}$   
(F)  $\frac{7}{8}$                       (G)  $-\frac{1}{8}$                       (H)  $-2$