Exam 1 Version 1022 (1)

Wednesday, April 8, 2026 6:34 PM

Exam 1
Version 1...

Test Number: 1022

MA 16010 **Exam 1** **Spring 2026**

Student's Name: Solutions **Section Number:** ____________

(Without your name and section number, we will NOT be able to locate your exam booklet.)

1. Fill out your name and section number in the space provided above. On the scantron, fill in **your name, section number, test number and student ID**. Sign your name.
2. You can write on this exam booklet. Turn in both your scantron and your exam booklet when you are done. Note: **you will be graded ONLY based on your scantron answer sheet**.
3. Only a TI-30Xa calculator is allowed. No exceptions. No other electronic devices are allowed. No books or notes are allowed.
4. There are 12 questions with 8 points each for a total of 96 points. You will have 60 minutes to complete the exam. Good luck!

Instructor	Time	Section	Instructor	Time	Section
Chlopecki, Anna	2:30pm	104	Chlopecki, Anna	2:30pm	103
Cuadra, Alexandra	1:30pm	818			
Delgado, Huimei	9:30am	500	Delgado, Huimei	10:30am	600
Delworth, Tim	7:30am	200			
Makarova, Maiia	12:30pm	106	Makarova, Maiia	1:30pm	105
Singh, Mansimar	9:30am	107	Singh, Mansimar	10:30am	108
Wong Katherine	7:30am	110	Wong Katherine	8:30am	109

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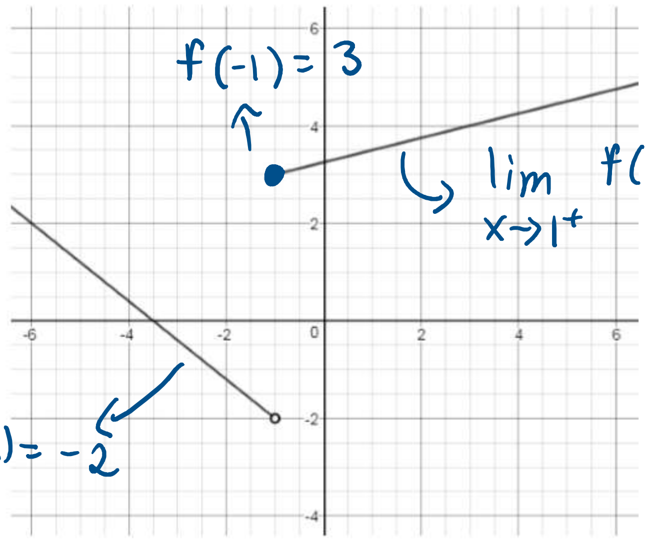
Problem 1

Given the graph of the function $f(x)$ below, which of the following is true?



$\lim_{x \to -1^-} f(x) = -2$

1. (A) $f(-1) = -2$ and $\lim_{x \to -1^-} f(x) = -2$.

   (B) $\lim_{x \to -1^-} f(x) = 3$ and $\lim_{x \to -1^+} f(x) = -2$.

   (C) $f(-1) = 3$ and $\lim_{x \to -1} f(x) = 3$.

   (D) $\lim_{x \to -1^+} f(x) = 3$ and $\lim_{x \to -1^-} f(x) = -1$.

   ● $f(-1) = 3$ and $\lim_{x \to -1} f(x)$ does not exist.

   (F) $f(-1)$ is undefined and $\lim_{x \to -1} f(x)$ does not exist.

Problem 2

Find $\lim_{x \to 0} \frac{\sin x}{x}$ numerically if it exists.

x	-0.1	-0.01	-0.001	-0.0001	0	0.0001	0.001	0.01	0.1
$f(x)$	0.99	0.99	0.99	0.99	$-$	0.99	0.99	0.99	0.99

2. (A) does not exist

(B) 2

(C) -1

(D) -2

(E) 1

(F) 0

Problem 3

Which of the following functions has a vertical asymptote at $x = 1$? → denominator has $x-1$

Only

3. (A) $y = \frac{x+1}{x^2+x} = \frac{x+1}{x(x+1)}$

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

(C) $y = \frac{x-1}{x^2-x} = \frac{x-1}{x(x-1)}$

(D) $y = \frac{x+3}{x^2+4x+3} = \frac{x+3}{(x+3)(x+1)}$

(E) $y = \frac{x^2-1}{x+1}$

(F) $y = \frac{x+3}{x^2+2x-3} = \frac{x+3}{(x+3)(x-1)}$

Problem 4

Find the limit if it exists:

$$\lim_{x\to 2} \frac{x^2-4}{x^2-2x} = \lim_{x\to 2} \frac{\cancel{(x-2)}(x+2)}{x\cancel{(x-2)}}$$

$$= \lim_{x\to 2} \frac{x+2}{x} = \frac{2+2}{2} = \frac{4}{2} = 2$$

4. (A) 4

(B) 2

(C) ∞

(D) The limit does not exist.

(E) 0

(F) 1

Problem 5

Jim is deriving the derivative of $f(x)$ using the limit definition and he writes, correctly,

$$f'(x) = \lim_{h\to 0} \frac{5(x+h)^2 - 5x^2}{h}. \quad = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$$

Which of the following functions could be $f(x)$?

5. (A) $5x^2 - x^5$

(B) $x^5 - 5x^2$

(C) x^2

(D) $5x$

(E) $5x^2$

(F) $x^2 - 5x$

Problem 6

A ball is thrown straight up from the top of a building and its position function in feet, in terms of time in seconds, is shown below. Find its velocity after 2 seconds.

$$s(t) = -16t^2 + 32t + 64$$

$v(t) = s'(t) = -32t + 32$

$v(2) = -32(2) + 32$

$= -32$

6. (A) 64 ft/sec

(B) -30 ft/sec

(C) -64 ft/sec

(D) -16 ft/sec

(E) -32 ft/sec

(F) 48 ft/sec

Problem 7

Given $f(x) = 5x^3 - 2x^{\frac{4}{3}} + \frac{3}{x^2}$. Find $f'(x)$.

$f(x) = 5x^3 - 2x^{4/3} + 3x^{-2}$

$f'(x) = 15x^2 - 2\left(\frac{4}{3}\right)x^{1/3} - 6x^{-3}$

$= 15x^2 - \frac{8}{3}x^{1/3} - \frac{6}{x^3}$

7. (A) $15x^2 - \frac{8}{3}x^{\frac{1}{3}} - \frac{6}{x}$

(B) $3x^2 - 8x^{\frac{1}{3}} - \frac{6}{x}$

(C) $15x^2 - \frac{8}{3}x^{\frac{1}{3}} + \frac{6}{x^3}$

(D) $15x^2 - \frac{8}{3}x^{\frac{1}{3}} - \frac{6}{x^3}$

(E) $3x^2 - \frac{4}{3}x^{\frac{1}{3}} - \frac{3}{x^3}$

(F) $15x^2 - \frac{8}{3}x + \frac{6}{x^3}$

Problem 8

Find the equation of the tangent line to the graph of $y = x^3 - 5x$ at $x = 2$.

$y' = 3x^2 - 5$

$y'(2) = 3(2)^2 - 5 = 7$

$y(2) = 2^3 - 5(2) = -2$

$y - y(2) = y'(2)(x-2)$

$y - (-2) = 7(x-2)$

$y + 2 = 7x - 14$

$y = 7x - 14 - 2$

$y = 7x - 16$

8. (A) $y = 7x - 16$

(B) $y = 2x - 9$

(C) $y = -2x - 8$

(D) $y = -2x + 11$

(E) $y = 2x - 6$

(F) $y = 7x + 14$

Problem 9

Given $g(x) = \frac{2\sqrt{x}}{x^2 - 8}$, find $g'(4)$.

$$\frac{2x^{1/2}}{x^2-8}$$

$u = 2x^{1/2}$ $\quad v = x^2 - 8$

$u' = x^{-1/2}$ $\quad v' = 2x$

$u(4) = 2 \cdot 4^{1/2} = 4$ $\quad v(4) = 4^2 - 8 = 8$

$u'(4) = x^{-1/2} = \frac{1}{2}$ $\quad v'(4) = 2(4) = 8$

$$g'(4) = \frac{u'(4)v(4) - u(4)v'(4)}{v^2(4)}$$

$$= \frac{\frac{1}{2}(8) - 4(8)}{8^2} = \frac{4-32}{64} = -\frac{28}{64} = \frac{-7}{16}$$

9. (A) $-\frac{1}{4}$

(B) $\frac{9}{16}$

(C) $-\frac{9}{8}$

(D) $-\frac{3}{32}$

(E) $-\frac{7}{16}$

(F) $\frac{7}{8}$

Problem 10

Given $f(x) = e^x \sin x$. Find $f'(x)$.

$u = e^x$ $\quad v = \sin x$

$u' = e^x$ $\quad v' = \cos x$

$$f'(x) = u'(x)v(x) + u(x)v'(x)$$

$$= e^x \sin(x) + e^x \cos x$$

$$= e^x(\sin x + \cos x)$$

10. (A) $e^x \cos x$

(B) $-e^x \cos x$

(C) $e^x(\sin x + \cos x)$

(D) $e^x(\sin x - \cos x)$

(E) $-e^x(\sin x + \cos x)$

(F) $e^x(\cos x - \sin x)$

Problem 11

Given $y = 2(4x^5 - 10x)^3$, find $y'(1)$.

11. (A) 60
(B) 216
(C) 3600
(D) 600
(E) 360
● 2160

$$y' = 2(3)(4x^5 - 10x)^2 \frac{d}{dx}(4x^5 - 10x)$$
$$= 2(3)(4x^5 - 10x)^2(20x^4 - 10)$$

$$y'(1) = 6(4-10)^2(20-10)$$
$$= 6(-6)^2(10)$$
$$= 2160$$

Problem 12

If $g(x) = -2\cos x + \tan x + \sec x$, then $g'\left(\frac{\pi}{4}\right)$ is equal to

12. (A) 2
(B) $3\sqrt{2}$
● $2\sqrt{2}+2$
(D) $\sqrt{2}$
(E) $2\sqrt{2}+1$
(F) $2\sqrt{2}$

$$g'(x) = -2(-\sin x) + \sec^2(x) + \sec(x)\tan(x)$$
$$= 2\sin(x) + \sec^2(x) + \sec(x)\tan(x)$$

$$\sin\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$$

$$\cos\left(\frac{\pi}{4}\right) = \frac{\sqrt{2}}{2} \Rightarrow \sec\left(\frac{\pi}{4}\right) = \frac{2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \sqrt{2}$$

$$\Rightarrow \sec^2\left(\frac{\pi}{4}\right) = (\sqrt{2})^2 = 2$$

$$\tan\left(\frac{\pi}{4}\right) = 1$$

$$= \frac{2\sqrt{2}}{2} + 2 + \sqrt{2}\cdot 1 = \sqrt{2} + 2 + \sqrt{2}$$
$$= 2\sqrt{2} + 2$$