

MTH 154-CALCULUS EXAM TWO (CL2): SAMPLE EXAM

PROBLEM 1. Let $f(x) = \ln\left(\frac{1-2x}{3+4x}\right)$. Which of the following is the derivative of $f(x)$?

- A. $-2\left(\frac{3+4x}{1-2x}\right)$ B. $-\frac{1}{2}\left(\frac{3+4x}{1-2x}\right)$ C. $6x + 2$ D. $\frac{3+4x}{1-2x}$
 E. $\frac{2}{(1-2x)(3+4x)}$ F. $-\frac{1}{2}$ G. $\frac{-2}{(1-2x)(3+4x)}$ H. $\frac{1-2x}{3+4x}$
 I. $-\left(\frac{3+4x}{1-2x}\right)$ J. Not listed here.
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PROBLEM 2. Let $f(x) = 4x^2e^{-x}$. Which of the following is the derivative of $f(x)$?

- A. $-8xe^{-x} + 4x^2e^{-x}$ B. $-8xe^{-x}$ C. $8x + e^{-x}$ D. $8xe^{-x}$
 E. $8xe^{-x} - 4x^2e^{-x}$ F. $-32x^3e^{-2x}$ G. $32x^3 + e^{-2x}$ H. $8xe^{-x} + 4x^2e^{-x}$
 I. $32x^3 - e^{-2x}$ J. $8x - e^{-x}$
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PROBLEM 3. Let $f(x) = \ln(x^2 + 2)$. Which of the following is the second derivative of $f(x)$?

- A. $\frac{2x}{x^2+2}$ B. $\frac{-4+2x^2}{(x^2+2)^2}$ C. $\frac{6x^2+4}{(x^2+2)^2}$ D. $\frac{-2x}{x^2+2}$
 E. $\frac{2x}{(x^2+2)^2}$ F. $\frac{2x}{\ln(x^2+2)}$ G. $\frac{-4x^2}{(x^2+2)^2}$ H. $\frac{-2x}{(x^2+2)^2}$
 I. $\frac{4-2x^2}{(x^2+2)^2}$ J. $\frac{-2x}{\ln(x^2+2)}$
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PROBLEM 4. Find all critical numbers of $f(x) = x^3 - 3x^2 - 24x + 1$. Which of the following is closest to the smallest critical number?

- A. -11 B. -10 C. -8 D. -9 E. -4
 F. -6 G. -2 H. -7 I. -12 J. -5

PROBLEM 5. Which of the following is closest to the largest critical number. Remember, if there is only one critical number it is both largest and smallest.

- A. 7 B. 12 C. 9 D. 4 E. 8
 F. 14 G. 6 H. 10 I. 5 J. 11
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PROBLEM 6. Let $f(x) = -7(-5x^2 + 6x)^4$. Which of the following is the derivative of $f(x)$?

- A. $28(-10x + 6)(-5x^2 + 6x)^3$ B. $-28(-10x + 6)(-5x^2 + 6x)^4$ C. $7(-10x + 6)(-5x^2 + 6x)^4$
 D. $28(-10x + 6)(-5x^2 + 6x)^4$ E. $-7(-10x + 6)(-5x^2 + 6x)^4$ F. $4(-10x + 6)(-5x^2 + 6x)^3$
 G. $-28(-10x + 6)(-5x^2 + 6x)^3$ H. $7(-10x + 6)(-5x^2 + 6x)^3$ I. $-7(-10x + 6)(-5x^2 + 6x)^3$
 J. Not listed here.

EXAM CONTINUES ON BACK OF SHEET

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PROBLEM 7. Find the absolute maximum and absolute minimum of the function $f(x) = -2x^3 + 36x^2 - 162x - 2$ on the interval from $x = 7$ to $x = 15$. The absolute minimum is closest to

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|----------|---------|---------|---------|----------|
| A. -1000 | B. -900 | C. -600 | D. -800 | E. -1200 |
| F. -1100 | G. -200 | H. -400 | I. -500 | J. -300 |

PROBLEM 8. The absolute maximum is closest to

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| A. 600 | B. 900 | C. 700 | D. 400 | E. -100 |
| F. 300 | G. 0 | H. 500 | I. 100 | J. 800 |
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PROBLEM 9. An open topped box with square base of volume 13500 cu. ft. is to be made of sheet metal. The minimum possible amount (in square feet) of sheet metal needed for such a box is closest to

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| A. 3300 | B. 3700 | C. 3400 | D. 2800 | E. 3500 |
| F. 3100 | G. 2700 | H. 2900 | I. 3600 | J. 3200 |

PROBLEM 10. The height of such a box when the amount of sheet metal is minimum is closest to

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| A. 17 | B. 19 | C. 16.5 | D. 15.5 | E. 14.5 |
| F. 16 | G. 18.5 | H. 19.5 | I. 17.5 | J. 15 |
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PROBLEM 11. Consider the function $f(x) = 2x^3 - 6x^2 - 30$. Which of the following sets is the set on which $f(x)$ is increasing?

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|-------------|------------------------|-----------------------|-----------------|
| A. $x < 2$ | B. $x < -2$ OR $x > 0$ | C. $x > -2$ | D. $-2 < x < 0$ |
| E. $x < 0$ | F. $0 < x < 2$ | G. $x < 0$ OR $x > 2$ | H. $x > 2$ |
| I. $x < -2$ | J. $x > 0$ | | |
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PROBLEM 12. Find the rightmost relative maximum of the function $f(x) = 2x^3 - 33x^2 + 108x - 5$. The x-coordinate is closest to

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| A. 2 | B. 6 | C. 11 | D. 5 | E. 4 |
| F. 1 | G. 3 | H. 8 | I. 9 | J. 10 |

The correct answers are: 1-J, 2-E, 3-I, 4-G, 5-D, 6-G, 7-F, 8-G, 9-G, 10-J, 11-G, 12-A