

Name: _____

ID # _____

CRN: _____

Pledge: _____

Instructions: please enter your NAME, ID NUMBER, FORM DESIGNATION, and your CRN on the op-scan sheet. The CRN should be written in the box labeled 'COURSE'. Darken the appropriate circles below your ID number and below the Form designation letter. Use a number 2 pencil. Machine grading may ignore faintly marked circles.

Mark your answers to the test questions in rows 1 through 17 of the op-scan sheet. Your score on this test will be the number of correct answers. You have one hour to complete this portion of the exam.

1. Given the table to the right, determine $\lim_{x \rightarrow -4} f(x)$, if it exists.

A. 3.882

B. -3.521

C. Limit does not exist because $f(-4)$ is undefined.

D. Limit does not exist because f is an oscillating function.

E. Limit does not exist because f does not approach the same value from both sides of $x=a$.

-4.01	3.88152
-4.001	3.70138
-4.0001	3.52126
-4.0	undefined
-3.9999	-3.52127
-3.999	-3.72131
-3.99	-3.80120

2. Determine the value of $\lim_{x \rightarrow 1} \frac{4x - 4}{x^2 + x - 2}$

A. $\frac{4}{3}$

B. $\frac{3}{4}$

C. 0

D. 1

E. Limit does not.

3. Find the critical point(s) of $f(x) = \left(\frac{2x}{x^2 + 1} \right)^3$.

A. $x = 0$

B. $x = 0, 1$

C. $x = 0, 2, -2$

D. $x = 0, 1, -1$

E. There are no critical points of this function.

8. Which of the following is an equation of the tangent line to the graph of $f(x) = 4x^2 - 7x + 3$ at the point $(2, f(2))$?

A. $y = 5x - 2$

B. $y = 8x - 7$

C. $y = 9x - 13$

D. $y = 9x + 5$

E. $y = (8x - 7)(x - 2) + 5$

9. If $\lim_{x \rightarrow \infty} f(x) = c$, then the following is true:

A. there exists a vertical asymptote at $x=c$ in the graph of $f(x)$.

B. there exists a horizontal asymptote at $y=c$ in the graph of $f(x)$.

C. there exists a removable discontinuity at $x=c$ in the graph of $f(x)$.

D. the limit indicates that $f(x)$ has a discontinuity at $x=c$.

E. the limit does not exist.

10. Let f be a function for which f' and f'' are defined on the interval (a,b) . If $f' < 0$ and $f'' < 0$ for (a,b) , then which of the following statement is TRUE?

A. f is increasing and concave upward on the interval

B. f is increasing and concave downward on the interval

C. f is decreasing and concave upward on the interval

D. f is decreasing and concave downward on the interval

E. not enough information has been given to determine these properties

11. Determine the slope of the tangent line to the curve $x^2y + 4x + y^2 = 16$ at the point $(1, 3)$

A. $-\frac{10}{7}$

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

C. $\frac{3}{2}$

D. $\frac{6}{7}$

E. $-\frac{4}{9}$

12. Differentiate $y = \sin(\cos(3x))$

A. $y' = \cos(\cos(3x))$

B. $y' = \cos(-\sin(3x))$

C. $y' = \sin(3x)\cos^2(3x)$

D. $y' = -3\sin(3x)\cos(\cos(3x))$

E. $y' = -3\sin x \sin(3x) + \cos x \cos(3x)$

13. For $f(x) = 2\sqrt{x}$ find all of the possible values on the interval $[0,9]$ that satisfy the conclusion of the Mean Value Theorem?

A. $x = \frac{2}{3}$

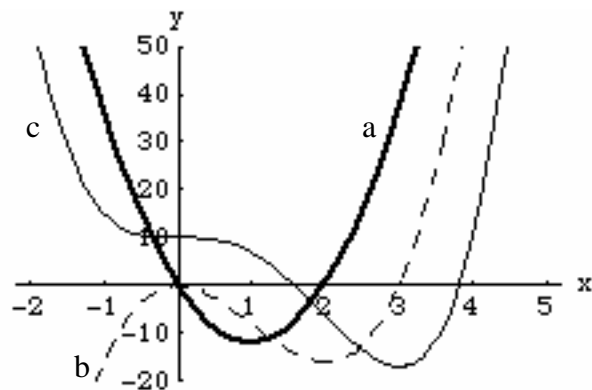
B. $x = \frac{4}{9}$

C. $x = \frac{9}{4}$

D. $x = \frac{3}{2}$

E. The Mean Value Theorem does not apply to $f(x)$ on this interval.

14. The following three graphs, labeled a, b, and c, are the graphs of the function and its first and second derivatives. Match the appropriate letter to $f(x)$, $f'(x)$, $f''(x)$.



A. $a = f(x)$, $b = f'(x)$, $c = f''(x)$

B. $b = f(x)$, $a = f'(x)$, $c = f''(x)$

C. $b = f(x)$, $c = f'(x)$, $a = f''(x)$

D. $c = f(x)$, $b = f'(x)$, $a = f''(x)$

E. $c = f(x)$, $a = f'(x)$, $b = f''(x)$

15. An oil tank in the shape of a right circular cylinder of radius 8m is being filled at a constant rate of $10 \frac{m^3}{\text{min}}$. How fast is the level of the oil rising? Recall: $V = \pi r^2 h$

A. Oil is rising at a rate of $64\pi \frac{m}{\text{min}}$

B. Oil is rising at a rate of $\frac{32\pi}{5} \frac{m}{\text{min}}$

C. Oil is rising at a rate of $\frac{5}{32\pi} \frac{m}{\text{min}}$

D. Oil is rising at a rate of $\frac{5}{8\pi} \frac{m}{\text{min}}$

E. Oil is rising at a rate of $\frac{1}{64\pi} \frac{m}{\text{min}}$

16. The Taylor Polynomial of degree three generated by $f(x) = \frac{1}{x}$ and centered at $a=2$ is:

A. $P_3(x) = \frac{1}{x} - \frac{1}{x^2}(x-2) + \frac{1}{x^3}(x-2)^2 - \frac{1}{x^4}(x-2)^3$

B. $P_3(x) = \frac{1}{2} - \frac{1}{4}(x-2) + \frac{1}{4}(x-2)^2 - \frac{3}{8}(x-2)^3$

C. $P_3(x) = \frac{1}{2} - \frac{1}{4}(x-2) + (x-2)^2 - (x-2)^3$

D. $P_3(x) = \frac{1}{2} - \frac{1}{4}(x-2) + \frac{1}{2}(x-2)^2 - \frac{1}{6}(x-2)^3$

E. $P_3(x) = \frac{1}{2} - \frac{1}{4}(x-2) + \frac{1}{8}(x-2)^2 - \frac{1}{16}(x-2)^3$

17. Determine $g''(x)$ if $g(x) = \frac{1}{2}x^3 - \sqrt{x} + \frac{1}{x^2}$.

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

B. $g''(x) = 3x + \frac{1}{4}x^{-\frac{3}{2}} + \frac{6}{x^4}$

C. $g''(x) = \frac{3}{2}x^2 - \frac{1}{2}x^{-\frac{1}{2}} - \frac{2}{x}$

D. $g''(x) = 3x + \frac{1}{4}x^{-\frac{3}{2}} + 1$

E. $g''(x) = 3x + \frac{1}{4}x^{-\frac{3}{2}} + \frac{1}{2}$