

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. Determine the value of $\lim_{x \rightarrow 1} \frac{x-1}{\sqrt{x}-1}$

- A. 1
- B. $\sqrt{2}$
- C. 2
- D. 4
- E. Limit does not exist because $f(1)$ is undefined.

2. In using the ϵ, δ definition to prove that $\lim_{x \rightarrow 4} \sqrt{x} = 2$, when $\epsilon = 1$, what is the largest value that δ can have?

- A. 1
- B. 3
- C. 4
- D. 5
- E. 9

3. If $f(x) = \left(\frac{5x^2 + 9x - 2}{x^2 + 5x + 6} \right)$, which of the following is FALSE.

- A. $\lim_{x \rightarrow -\infty} f(x) = 5$
- B. $\lim_{x \rightarrow 0} f(x) = \frac{-1}{3}$
- C. $\lim_{x \rightarrow -2} f(x)$ does not exist
- D. $f(x)$ has a vertical asymptote at $x = -3$
- E. $f(x)$ has a horizontal asymptote at $y = 5$

4. If the tangent line to $y = f(x)$ at $(5,1)$ also passes through the point $(2,7)$ then $f'(5)$ equals

- A. -2 B. -3
C. -4 D. -5
E. -6
-

5. Find the y- intercept of the tangent line to the curve $y = \sqrt{x+3}$ at the point $(1,2)$.

- A. $\frac{1}{4}$ B. $\frac{3}{4}$
C. 1 D. $\frac{7}{4}$
E. 2
-

6. If, $f(x) = \begin{cases} x+2 & ; x \leq -1 \\ x^2 & ; x > -1 \end{cases}$ then which of the following is true?

- A. f is not differentiable for any x .
B. f is differentiable but not continuous at $x = -1$.
C. f is continuous and differentiable at $x = -1$.
D. f is continuous but not differentiable at $x = -1$.
E. f is neither continuous nor differentiable at $x = -1$.
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7. Find the critical point(s) of $f(x) = x^{\frac{1}{2}}(1-x)$.

- A. $x = 0$ B. $x = \frac{1}{3}$
C. $x = 0, \frac{1}{3}$ D. $x = 0, 1$
E. $x = 0, \frac{1}{3}, 1$

8. The absolute maximum of $f(x) = x^3 + 2x^2 - 4x$ on $[-10, 0]$ equals:

A. 8

B. 1

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

D. $\frac{-40}{27}$

E. -2

9. Determine the interval on which $f(x) = x \sin(x) + \cos(x)$, $0 \leq x \leq p$, is increasing.

A. $[0, p]$

B. $[0, \frac{p}{2}]$

C. $[0, \frac{2p}{3}]$

D. $[\frac{p}{6}, p]$

E. $[\frac{p}{2}, p]$

10. Let f be a function for which f' and f'' are defined on the interval $(1, 8)$. If $f' < 0$ and $f'' > 0$ for $(1, 8)$, 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 $x^3 + y^2 = 4x^2y - 7$ at the point $(2, 1)$

A. 6

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

C. $\frac{10}{9}$

D. $\frac{-1}{8}$

E. $\frac{-2}{7}$

12. Differentiate $y = \tan^7(q^3)$

A. $y'(q) = 21q^2 \tan^6(q^3) \sec^2(q^3)$ B. $y'(q) = 7 \tan^6(q^3) \sec^2(q^3)$

C. $y'(q) = 7 \sec^{12}(3q^2)$ D. $y'(q) = 21q^2 \sec^{12}(q^3)$

E. $y'(q) = 7 \tan^6(q^3)$

13. How many points of inflection does the function $f(x) = x^6 + x^4$ have?

A. 3

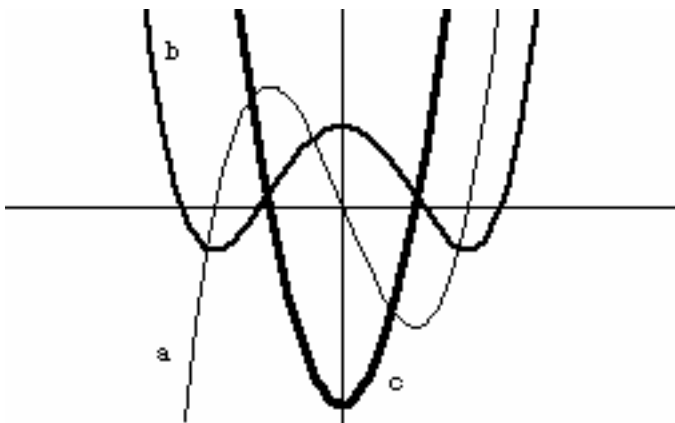
B. 2

C. 1

D. 0

E. 4

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. A cardboard box of 32in^3 volume with a square base and open top is to be constructed. Find the dimensions of the box that would minimize surface area.

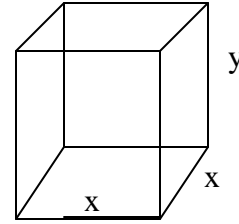
A. $4" \times 4" \times 2"$

B. $16" \times \sqrt{2}" \times \sqrt{2}"$

C. $32" \times 1" \times 1"$

D. $2" \times 2" \times 8"$

E. $8" \times 8" \times \frac{1}{2}"$



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

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

B. $P_3(x) = 0 + \frac{2}{x}(x-1) - \frac{1}{x^2}(x-1)^2 + \frac{2}{3x^3}(x-1)^3$

C. $P_3(x) = 2(x-1) - 2(x-1)^2 + 4(x-1)^3$

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

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

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

A. $g''(1) = \frac{1}{2}$

B. $g''(1) = \frac{1}{8}$

C. $g''(1) = \frac{-3}{16}$

D. $g''(1) = \frac{2}{3}$

E. $g''(1) = \frac{-1}{16}$