

MA 161 - FINAL EXAM

GREEN Final Exam - Test Version 01

INSTRUCTIONS

1. Make sure the color of your scantron matches the color of this cover page.
2. Use a # 2 pencil to fill in your scantron and fill in the circles. The **GREEN** exam is Test **01**. Your PUID and your 4-digit section number must be correct.
3. There are **14** different pages including this cover page. Make sure you have a complete test. Each problem is worth 8 points.
4. Do any necessary work for each problem on the space provided or on the back of the pages of this test booklet. Circle your answers in this test booklet - in case of a lost scantron.
5. After you have finished the exam, hand in your scantron and your test booklet to your recitation instructor.

ACADEMIC DISHONESTY

1. *Do not open the exam booklet until you are instructed to do so.*
2. *Do not leave the exam room during the first 20 minutes or the last 10 minutes of the exam.*
3. *Do not seek or obtain any kind of help from anyone to answer questions on this exam. If you have questions, consult only your instructor.*
4. *Books, notes, calculators, phones, or any other electronic devices are not allowed on the exam. Students should store them in their pockets and/or backpacks.*
5. *After time is called, students have to put down all writing instruments and remain in their seats and wait for the TAs to collect the scantrons and the exams.*
6. *Anyone who violates these instructions will have committed an act of academic dishonesty. Penalties for academic dishonesty can be very severe. All cases of academic dishonesty will be reported immediately to the Office of the Dean of Students.*

I have read and understand the above statements regarding academic dishonesty:

NAME _____ **PUID #** _____

STUDENT SIGNATURE _____

TA NAME _____ **RECITATION Section #** _____

Liu	Owens	Weld	Yochman
0261	0241	0231	0211
0281	0271	0291	0221

1. If $a > 0$ and $b > 0$, which of these statements is/are **TRUE** ?

(i) $e^{a-2b} = \frac{e^a}{e^{2b}}$

(ii) $\frac{\ln a}{\ln b} = \ln\left(\frac{a}{b}\right)$

(iii) $\ln(ae^b) = b + \ln a$

- A. Only (i) and (ii)
- B. Only (i) and (iii)
- C. Only (ii) and (iii)
- D. Only (i)
- E. All three are **TRUE**

2. For what value of k will $f(x)$ be continuous for all values of x ?

$$f(x) = \begin{cases} \frac{x^2 - 3k}{x - 3}, & -\infty < x \leq 2 \\ 8x - k, & 2 < x < \infty \end{cases}$$

- A. $k = 2$
- B. $k = 3$
- C. $k = 4$
- D. $k = 5$
- E. No value of k

3. Compute y' if $y = \left(\frac{x}{x+2}\right)^3$.

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

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

C. $y' = \frac{4x^2}{(x+2)^4}$

D. $y' = \frac{6x^2}{(x+2)^4}$

E. $y' = 3\left(\frac{x}{x+2}\right)^2$

4. An equation of the tangent line to the curve $y = 4x\sqrt{x}$ at the point $(1, 4)$ is

A. $y = 2x + 2$

B. $y = -2x + 6$

C. $y = 6x - 1$

D. $y = 4x$

E. $y = 6x - 2$

5. If the graph of $f(x)$ is as shown in Figure 1, then the graph of its derivative, $f'(x)$, looks most like which graph below?

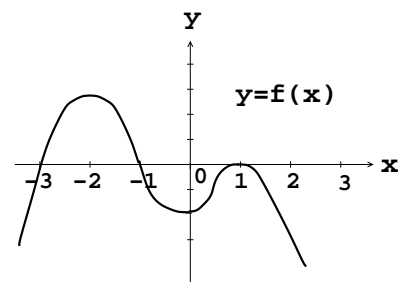
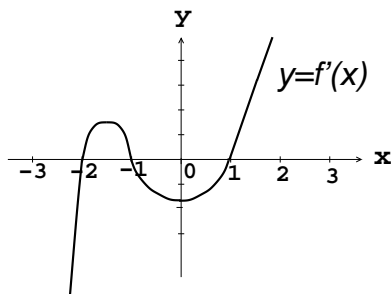
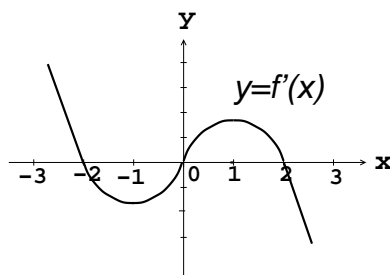


Figure 1

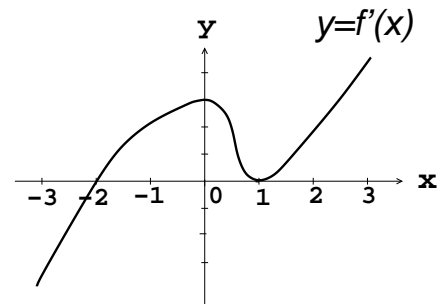
A.



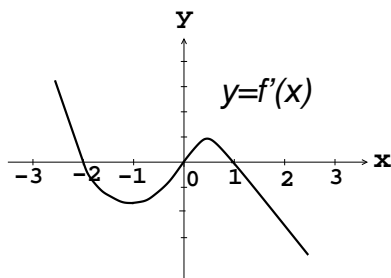
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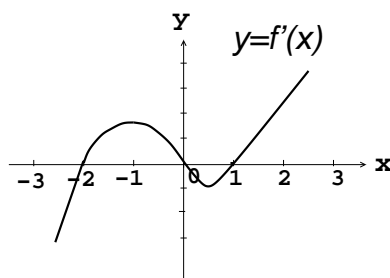
C.



D.



E.



6. The position of an object moving in a straight line at time t is

$$s(t) = t \ln(2t) \text{ meters.}$$

When will its velocity be 3 m/sec?

- A. $t = \frac{1}{2}e$
- B. $t = \frac{1}{2}e^2$
- C. $t = \frac{1}{2}e^3$
- D. $t = \frac{3}{2}$
- E. $t = \frac{1}{2e^3}$

7. Find the second derivative of $f(x) = e^{(x^2-x)}$.

A. $f''(x) = (2x - 1)^2 e^{x^2-x}$

B. $f''(x) = (2x - 1) e^{x^2-x} + 2e^{x^2-x}$

C. $f''(x) = (2x - 1)^2 e^{x^2-x} + 2e^{x^2-x}$

D. $f''(x) = (x^2 - x)^2 e^{x^2-x}$

E. $f''(x) = (2x - 1)^2 e^{2x^2-2x} + e^{x^2-x}$

8. If the function y is defined implicitly by $xy^3 - x^3 = y + 4$, find $\frac{dy}{dx}$.

A. $\frac{dy}{dx} = 3x^2 + y^3 - 1$

B. $\frac{dy}{dx} = \frac{3x^2 - y^3}{3xy^2 - 1}$

C. $\frac{dy}{dx} = \frac{x^2 - y^2}{3xy^2 - 1}$

D. $\frac{dy}{dx} = \frac{3x^2 + y^3}{xy^2 + 1}$

E. $\frac{dy}{dx} = \frac{3x^2 - 3y^2}{3xy^2 - 1}$

9. Find the derivative of $y = 2^{-x}$.

A. $\frac{dy}{dx} = -\frac{\ln 2}{2^x}$

B. $\frac{dy}{dx} = 2^{x-1} \ln 2$

C. $\frac{dy}{dx} = 2^x \ln 2$

D. $\frac{dy}{dx} = 2^x \ln \frac{1}{2}$

E. $\frac{dy}{dx} = -x2^{-x-1} \ln 2$

10. If f is differentiable for all x and $H(x) = f(\cos 3\pi x)$, then $H'(x) =$

A. $-(\sin 3\pi x) f'(\cos 3\pi x)$

B. $-3\pi(\sin 3\pi x) f'(\cos 3\pi x)$

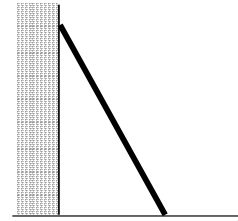
C. $-3\pi(\cos 3\pi x) f'(\sin 3\pi x)$

D. $-3\pi f'(\cos 3\pi x)$

E. $-3\pi f'(\sin 3\pi x)$

11. A short 5 ft ladder leans against a 20 ft wall. If the bottom of the ladder slides away from the wall at a rate of $\frac{1}{2}$ ft/sec, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 4 ft from the wall?

- A. -2 ft/sec
- B. $-\frac{1}{2}$ ft/sec
- C. $-\frac{2}{3}$ ft/sec
- D. $-\frac{3}{5}$ ft/sec
- E. $-\frac{5}{2}$ ft/sec



12. Find the absolute maximum value of $f(x) = 48x - x^3$ over the closed interval $[-1, 2]$.

- A. 20
- B. 24
- C. 47
- D. 88
- E. 132

13. If $g(x)$ is continuous for all x and its derivative is given by

$$g'(x) = (x - 1)^2 (x + 6) \sqrt[3]{x + 4},$$

which of these three statement(s) is/are **TRUE** ?

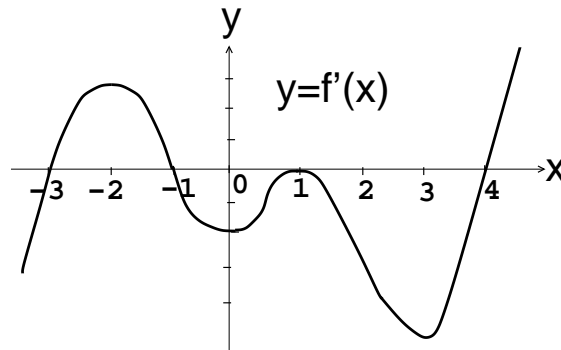
(I) $g(x)$ has a local minimum value at $x = -4$.

(II) $g(x)$ has a local maximum value at $x = 1$.

(III) $g(x)$ is decreasing when $x < -6$.

- A. Only (I) and (II)
- B. Only (II) and (III)
- C. Only (I) and (III)
- D. Only (I)
- E. All three are TRUE

14. Given the graph of $f'(x)$ below, at what values of x will f have a *local minimum* value?



- A. $x = 0$ and $x = 3$
- B. $x = -3$ and $x = 4$
- C. $x = -3$ and $x = 1$
- D. $x = -3$ and $x = 0$
- E. $x = 0$ and $x = 1$

15. The function $f(x) = 2x^6 - 5x^4 + 3x - 1$ has inflection points at what values of x ?

- A. Only at $x = 0$
- B. Only at $x = 0$ and $x = 1$
- C. Only at $x = -1$, $x = 0$, and $x = 1$
- D. Only at $x = -1$ and $x = 1$
- E. Only at $x = 1$

16. If $\alpha = \lim_{x \rightarrow 0^+} x^2 \ln x$, then

- A. $\alpha = 0$
- B. $\alpha = 2$
- C. $\alpha = \frac{1}{2}$
- D. $\alpha = -\infty$
- E. $\alpha = 1$

17. If $f(x) = 4e^{3x}$, compute $\lim_{h \rightarrow 0} \frac{f(2+h) - f(2)}{h}$.

- A. 0
- B. $12e^6$
- C. $6e^6$
- D. $4e^6$
- E. $2e$

18. The function $f(x) = \frac{3x^2 - 1}{x^2 - x}$ has

- A. 2 Vertical Asymptotes and 1 Horizontal Asymptote
- B. 1 Vertical Asymptote and 1 Horizontal Asymptote
- C. 1 Vertical Asymptote and 2 Horizontal Asymptotes
- D. 2 Vertical Asymptotes and No Horizontal Asymptote
- E. No Vertical Asymptotes and 1 Horizontal Asymptote

19. If $a, b \neq 0$, then $\lim_{x \rightarrow 0} \frac{\cos(ax) - \cos(bx)}{ax^2} =$

A. $\frac{b^2 - a^2}{2a}$

B. $\frac{a^2 + b^2}{2a}$

C. $\frac{a - b}{2a}$

D. 0

E. $\frac{a^2 - b^2}{2}$

20. $\int_0^1 (2x + 1)^3 dx =$

A. 40

B. 20

C. 5

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

E. 10

21. Compute $\frac{d}{dx} \left\{ \int_1^{x^2} \frac{4t^3}{2+t} dt \right\}$.

A. $\frac{4x^2}{2+x^2}$

B. $\frac{4x^6}{2+x^2}$

C. $\frac{8x^6}{2+x^2}$

D. $\frac{4x^3}{2+x}$

E. $\frac{8x^7}{2+x^2}$

22. $\int 9x^2 \sqrt{4+x^3} dx =$

A. $3x^3(4+x^3)^{\frac{3}{2}} + C$

B. $2x(4+x^3)^{\frac{3}{2}} + C$

C. $2(4+x^3)^{\frac{3}{2}} + C$

D. $3\sqrt{4+x^3} + C$

E. $\frac{9}{2}(4+x^3)^{\frac{3}{2}} + C$

23. If $F(x) = \frac{2x}{x+1}$, compute $\int_1^3 F'(x) dx$.

A. 2

B. 1

C. $\frac{1}{2}$

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

E. $\frac{5}{2}$

24. Given that $\int_2^5 f(x) dx = 3$ and $\int_2^3 f(x) dx = -4$, then find $\int_3^5 f(x) dx$.

A. -1

B. 7

C. -2

D. 14

E. 1

25. If $I = \int_0^{\frac{1}{6}} 4 \cos(\pi t) dt$, then

A. $I = \frac{2}{\pi}$

B. $I = \frac{1}{2\pi}$

C. $I = \frac{4}{\pi}$

D. $I = \frac{2}{4\pi}$

E. $I = \frac{\sqrt{3}}{2\pi}$