MA 161 & 161E **FINAL EXAM** **Fall 2005**

Name ______________________

ten-digit Student ID number ______________________

Recitation Instructor ______________________

Div-Sec ______________________

Recitation Time ______________________

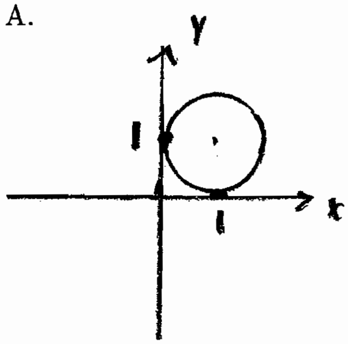
Instructions:

1. Fill in all the information requested above and on the scantron sheet.
2. The exam has 25 problems, each worth 8 points, for a total of 200 points.
3. For each problem mark your answer on the scantron sheet and also circle it in this booklet. Use a number 2 pencil on the answer sheet. Be sure to fill in the circles for each of the answers of the 25 exam questions.
4. Work only on the pages of this booklet.
5. Books, notes, or calculators are not to be used on this test.
6. At the end turn in your exam and scantron sheet to your recitation instructor.

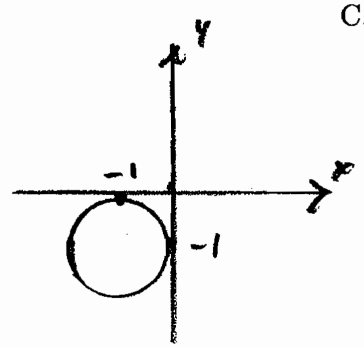
Name ______________________________

1. Determine the graph corresponding to the equation $x^2 - 2x + y^2 + 2y = -1$.

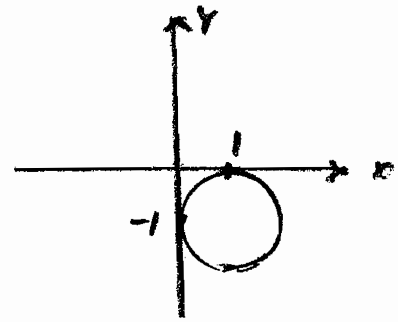
A.



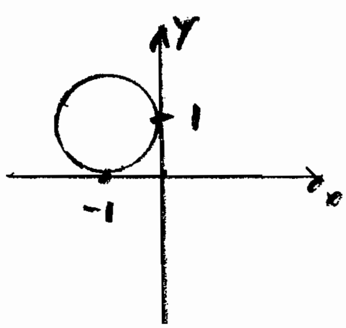
B.



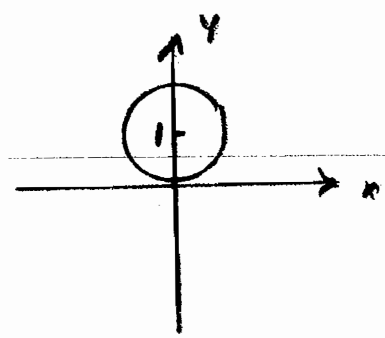
C.



D.

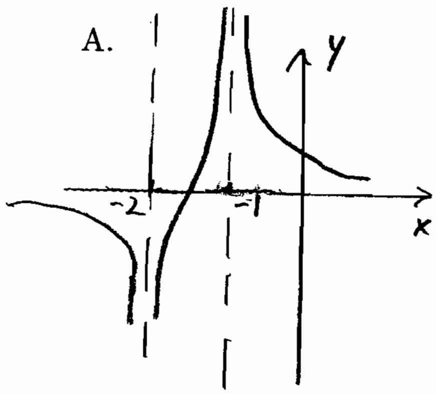


E.

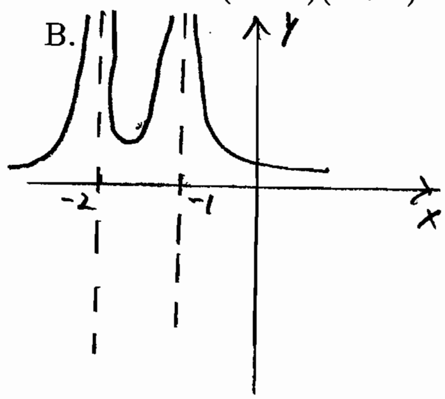


2. Determine the graph that represents $y = \dfrac{1}{(x+1)(x+2)}$.

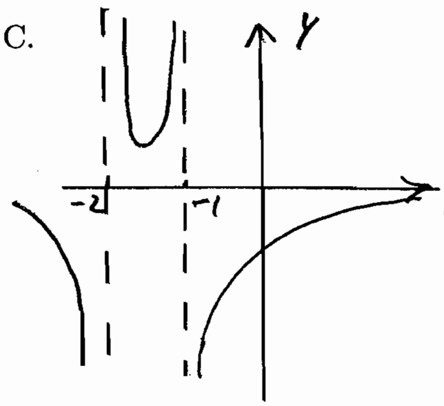
A.



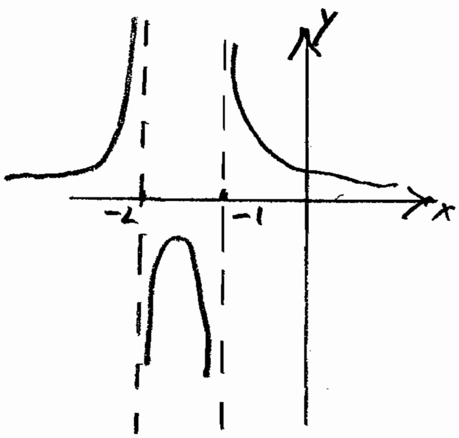
B.



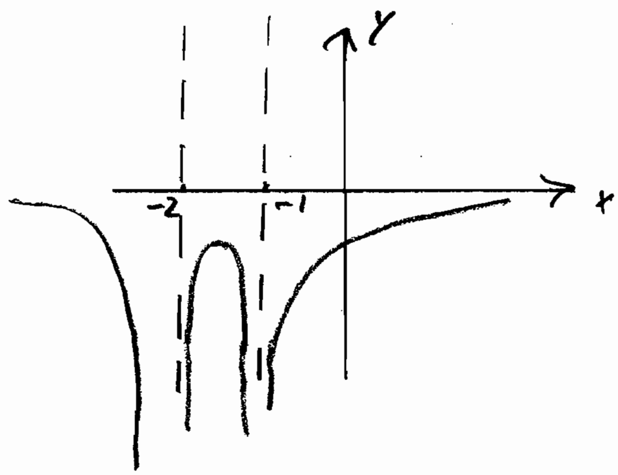
C.



D.



E.



3. The domain of $f(x) = \dfrac{1}{\sqrt{(x-1)(x-2)}}$ is

A. $(1, 2)$

B. $(-\infty, 1) \cup (2, \infty)$

C. $(2, \infty)$

D. $(1, 2) \cup (2, \infty)$

E. $(-\infty, 1)$

4. If $f(x) = \dfrac{1}{x} + x$ and $g(x) = x - 8$ then $f \circ g(9) =$

A. 1

B. 2

C. 3

D. 4

E. 5

5. $\lim_{x\to\infty} \frac{\sqrt{4x^2+2x}}{3x+1} =$

A. ∞

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

C. 0

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

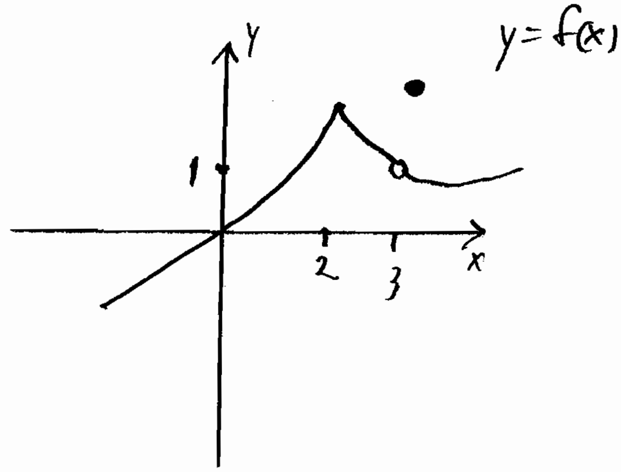
E. does not exist

6. The curve below is the graph of $f(x)$. Which of the following statements are true?

1) $f(x)$ is continuous at $x = 2$

2) $f(x)$ is differentiable at $x = 2$

3) $\lim_{x\to 3} f(x) = 1$



A. just 1)

B. just 1) and 2)

C. just 1) and 3)

D. all three

E. just 3)

7. If $xy^3 = x - y$ then $\dfrac{dy}{dx} =$

A. $\dfrac{1-y^2}{1+2xy^2}$

B. $\dfrac{1-y^3}{1-3xy^2}$

C. $\dfrac{1+y^3}{1+3xy^2}$

D. $\dfrac{1+y^2}{1+3xy^2}$

E. $\dfrac{1-y^3}{1+3xy^2}$

8. A man stands on a 100 ft building and throws a ball straight up with initial velocity 80 ft/sec. What is the ball's maximum height? ($s = -16t^2 + v_0 t + s_0$)

A. 100 ft

B. 200 ft

C. 300 ft

D. 400 ft

E. none of these

9. $\dfrac{d}{dx}\ln(x^2\cos^3(x)) =$

A. $\dfrac{2}{x} - 3\tan x$

B. $\dfrac{1}{x^2} - \sec^3 x$

C. $\dfrac{2}{x} + 3\sec x$

D. $\dfrac{2}{x} - 3\sec x$

E. none of these

10. $\dfrac{d}{dx}\left(x^{\ln x}\right) =$

A. $(\ln x)x^{\ln x}$

B. $2(\ln x)x^{\ln x+1}$

C. $x^{\ln x}$

D. $2(\ln x)x^{\ln x}$

E. $2(\ln x)x^{\ln x-1}$

11. $\dfrac{d}{dx}\cosh(x)$ at $x = \ln 2$ equals

A. $\dfrac{3}{2}$

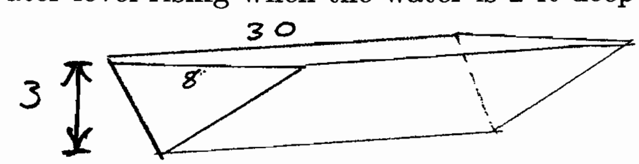
B. 2

C. $\dfrac{3}{4}$

D. 3

E. 4

12. A water trough is 30 ft long and a cross–section has the shape of a triangle that is 8 ft wide at the top and has height 3 ft. The trough is being filled at the rate of 40 ft^3/min. How fast is the water level rising when the water is 2 ft deep?



A. $\dfrac{1}{8}$ ft/min

B. $\dfrac{1}{4}$ ft/min

C. $\dfrac{1}{2}$ ft/min

D. 1 ft/min

E. 2 ft/min

13. Find $f'(x)$ if it is known that $\frac{d}{dx}[f(4x)] = x^2$.

A. $\frac{x^2}{64}$

B. $\frac{x^2}{16}$

C. $\frac{x^2}{4}$

D. x^2

E. $4x^2$

14. If $f(x) = 4x^2 \qquad 0 \le x \le 1,$
$\qquad = (x-3)^2 \qquad 1 < x \le 4,$
then the absolute maximum value of f is

A. 1

B. 2

C. 5

D. 3

E. 4

15. Find all values of t for which the function

$$y = \sin^2 t + \cos t$$

has an absolute maximum on the interval $[-\frac{\pi}{2}, \frac{\pi}{2}]$.

A. $\left\{-\frac{\pi}{3}, \frac{\pi}{3}\right\}$

B. $\left\{-\frac{\pi}{6}, \frac{\pi}{6}\right\}$

C. $\left\{-\frac{\pi}{2}, -\frac{\pi}{6}\right\}$

D. $\left\{\frac{\pi}{6}, \frac{\pi}{2}\right\}$

E. $\left\{\frac{\pi}{6}, \frac{\pi}{3}\right\}$

Problems 16, 17 and 18 refer to the function $f(x) = 2x^3 + 3x^2 - 12x$.

16. Find all open intervals where f is increasing.

A. $(-\infty, -2)$

B. $(-2, 1)$

C. $(1, \infty)$

D. $(-2, 1) \cup (1, \infty)$

E. $(-\infty, -2) \cup (1, \infty)$

17. Find all open intervals where f is convex up.

A. $\left(\frac{1}{2}, \infty\right)$

B. $\left(-\infty, \frac{1}{2}\right)$

C. $\left(-\frac{1}{2}, \infty\right)$

D. $\left(-\infty, -\frac{1}{2}\right)$

E. $\left(-\frac{1}{2}, \frac{1}{2}\right)$

18. Find all values of x for which f has a local minimum.

A. $\{1\}$

B. $\{-2\}$

C. $\{-2, 1\}$

D. $\left\{-2, \frac{1}{2}\right\}$

E. $\left\{-2, \frac{1}{2}, 1\right\}$

19. $\lim\limits_{t \to 0} \dfrac{\cos(2t) - 1}{t^2} =$

A. 2

B. -2

C. 4

D. -4

E. 0

20. $\lim\limits_{x \to 2} \dfrac{(x-2)^2}{|x-2|} =$

A. 1

B. -1

C. 0

D. 2

E. the limit does not exist

21. The maximum area for a rectangle inscribed into the ellipse

$$\frac{x^2}{4} + \frac{y^2}{18} = 1 \text{ is}$$

A. $\sqrt{2}$

B. $2\sqrt{2}$

C. $6\sqrt{2}$

D. $12\sqrt{2}$

E. $24\sqrt{2}$

22. $\int_{-1}^{1} (x^2 + 2x + 1)dx =$

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

B. -1

C. $1\frac{2}{3}$

D. $-1\frac{2}{3}$

E. 0

23. $\int_0^{\sqrt{3}} t\sqrt{t^2+1}\,dt =$

A. $\frac{1}{3}$

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

C. 1

D. $\frac{7}{3}$

E. $\frac{5}{3}$

24. If $g(x) = \int_{x^2}^{x} \frac{dt}{t}$ then $g'(x) =$

A. $\frac{1}{x^2}$

B. $\frac{1}{x}$

C. $\frac{1}{x} - \frac{1}{x^2}$

D. $\frac{1}{x} + \frac{1}{x^2}$

E. $-\frac{1}{x}$

25. Let $f(x)$ be continuous on $[-1,3]$ and assume that $f'(x)$ exist on $(-1,3)$. If $f(-1) = -2$ and $f(3) = 2$ then which of the following statements are always true?

1) There is a c such that $-1 < c < 3$ and $f(c) = 1$.

2) There is a c such that $-1 < c < 3$ and $f'(c) = 1$.

3) $-2 \le f(x) \le 2$ for all x such that $-1 \le x \le 3$.

A. just 1)

B. just 2)

C. just 3)

D. just 1) and 2)

E. just 1) and 3)