MATH 1241
Common Final Examination
Multiple Choice Section
Fall, 1996

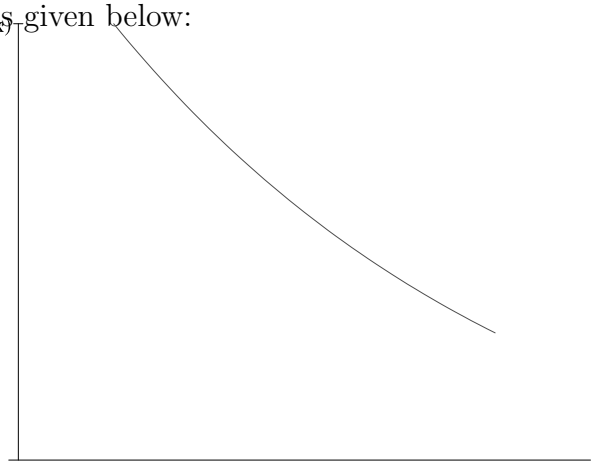
This exam is divided into two parts. These pages contain Part I which consists of 20 multiple choice questions. Part II consists of 6 free response questions You have three hours for the entire test. Part I should be completed in two hours. Part II should be completed in one hour.

This part of the exam consists of 20 multiple choice questions. They are printed on the front and back of each page. Be sure that you answer 20 different questions. A special answer sheet is provided so that your answers can be machine graded.

- You must use a pencil with a soft black lead (#2 or HB) to enter your answers on the answer sheet.
- For each question choose the response which best fits the question.
- The **exact** numerical value of the correct answer does not always appear among the choices given. When this happens, select among the choices the choice that **best approximates** the exact numerical value.
- If you wish to change an answer, make sure that you completely erase your old answer and any other extraneous marks.
- There is no penalty for guessing.
- If you mark more than one answer to a question, that question will be scored as incorrect.
- You may perform your calculations on the test itself or on scratch paper, but do not make any stray marks on the answer sheet.
- **Make sure that your name appears on the answer sheet and that you fill in the circles corresponding to your name.**

At the end of the examination you MUST hand in this test booklet, your answer sheet and all scratch paper.

1. The graph of the function $f(x)$ is given below:



The table that best describes $f(x)$ is:

(a)

x	1	2	3	4	5
$f(x)$	30	24	18	12	6

(b)

x	1	2	3	4	5
$f(x)$	30	33	36.3	39.93	43.923

(c)

x	1	2	3	4	5
$f(x)$	30	31	33	37	45

(d)

x	1	2	3	4	5
$f(x)$	30	29	27	23	15

(e)

x	1	2	3	4	5
$f(x)$	30	24	19.2	15.36	12.288

2. If $f(x) = e^{x+2} - 1$, then $\ln(f(3) + 1)$ equals

(a) $e^5 + 1$

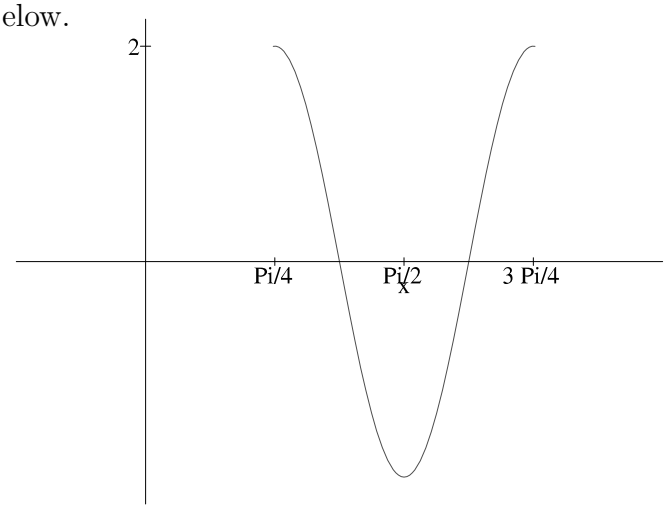
(b) 0

(c) 5

(d) $e^5 - 2$

(e) $\ln(5)$

3. The function $f(x)$ is graphed below.



A possible formula for $f(x)$ is:

(a) $2\cos(2x + \frac{\pi}{2})$

(b) $2\cos(4x - \pi)$

(c) $2\cos(4x - \frac{\pi}{4})$

(d) $2\cos(2x - \frac{\pi}{4})$

(e) $2\cos(4x + \pi)$

4. A function $f(x)$ is decreasing and concave down. Also, $f'(3) = -2$ and $f(x) = 5$. The equation of the tangent line at $(3, f(x))$ is:

(a) $2x + y = 11$

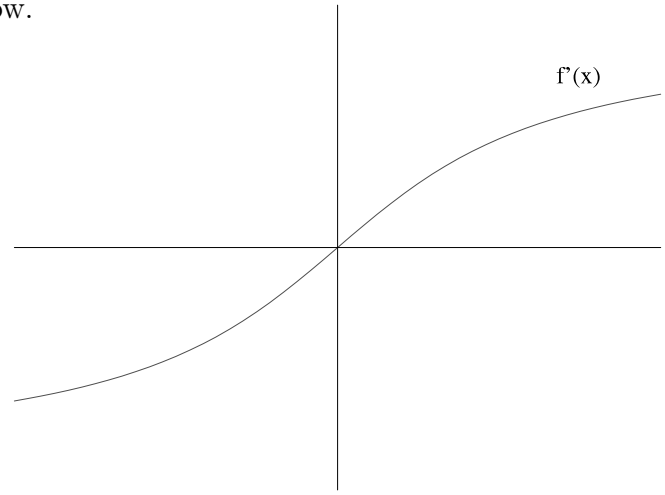
(b) $-2x + y = -1$

(c) $x - 2y = -7$

(d) $x + 2y = 13$

(e) $2x + y = 13$

5. The graph of $f'(x)$ is given below.



(a) $f(x)$ is an increasing function.

(b) $f(x)$ is a decreasing function.

(c) $f(x)$ is a constant function.

(d) $f(x)$ increases for all $x < 0$ and $f(x)$ decreases for all $x > 0$.

(e) $f(x)$ decreases for all $x < 0$ and $f(x)$ increases for all $x > 0$.

6. Let $f(x)$ be the elevation, in feet, of an airplane x miles from its destination airport. The units of $f'(x)$ are:

(a) feet.

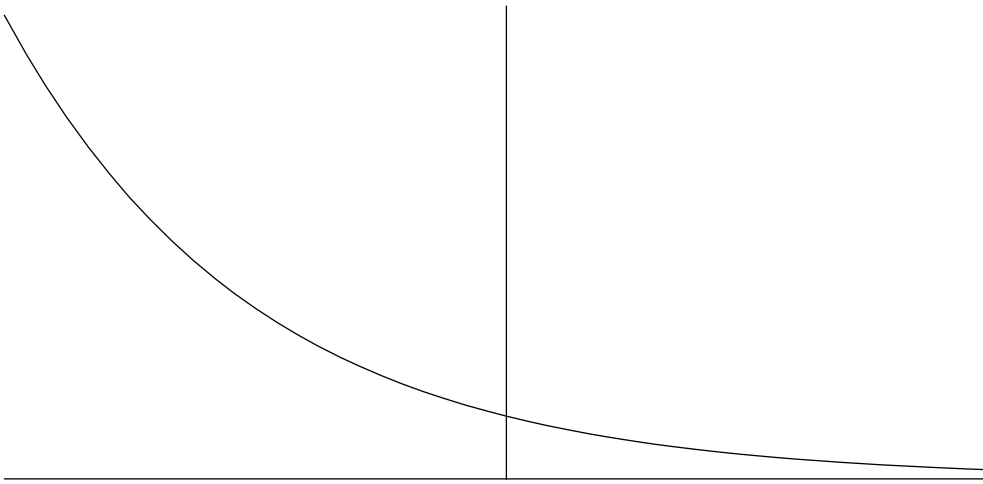
(b) feet per mile.

(c) hours.

(d) miles.

(e) miles per hour.

7. For the function f whose graph is shown,



(a) $f(x) > 0$, $f'(x) > 0$, $f''(x) > 0$ for all x.

(b) $f(x) > 0$, $f'(x) < 0$, $f''(x) > 0$ for all x.

(c) $f(x) > 0$, $f'(x) < 0$, $f''(x) < 0$ for all x.

(d) $f(x) < 0$, $f'(x) > 0$, $f''(x) < 0$ for all x.

(e) $f(x) < 0$, $f'(x) < 0$, $f''(x) > 0$ for all x.

8. As h approaches 0, $\dfrac{\cos\left(\frac{\pi}{6} + h\right) - \frac{\sqrt{3}}{2}}{h}$ approaches

(a) $-\dfrac{\sqrt{3}}{2}$

(b) 0

(c) -0.5

(d) $\frac{\pi}{6} - \frac{\sqrt{3}}{2}$

(e) -1

9. If $f(x) = 3 \cdot [g(x)]^2 + 6$, then $f'(x)$ equals:

   (a) $2g(x) \cdot g'(x) + 6$

   (b) $6 \cdot g'(x)$

   (c) $[g(x)]^3 + 6 \cdot g(x)$

   (d) $6 \cdot g(x) \cdot g'(x)$

   (e) $6 \cdot g'(x) + 6$

10. Consider the function, $f(x) = 2 - e^x$. The slope of the line tangent to the graph of $f(x)$ where $f(x)$ crosses the y-axis is

    (a) 0

    (b) 1

    (c) -1

    (d) e^2

    (e) e^{-2}

11. For the functions f, g, and h, we know the following values:

$$\begin{array}{lllll} f(2) = -2 & g(2) = 4 & g(3) = 6 & h(4) = 1 & h(3) = 2 \\ f(3) = 4 & g'(2) = 6 & g'(3) = 8 & h'(4) = -4 & h'(3) = -1 \end{array}$$

    If $f(x) = g(h(x))$, then $f'(3)$ equals:

    (a) -8

    (b) -6

    (c) -4

    (d) -2

    (e) 0

12. The slope of a curve at any point (x, y) is $\dfrac{dy}{dx} = (x+3)\sin(x)$. At the point where $x = 0$, the curve has a

    I. horizontal tangent

    II. local maximum

    III. point of inflection

    (a) I only

    (b) I and II only

    (c) II only

    (d) II and III only

    (e) I and III only

13. If $xy^2 = 1$, then the value of $\dfrac{dy}{dx}$ when $y = 2$ is:

    (a) $\dfrac{1}{2}$

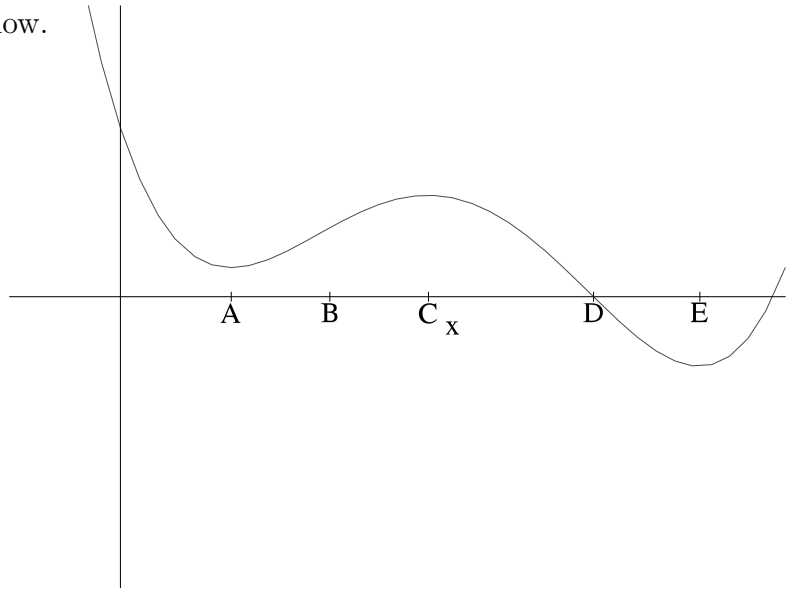
    (b) $\dfrac{1}{4}$

    (c) $-\dfrac{1}{4}$

    (d) -4

    (e) -2

14. The graph of $f'(x)$ is given below.



The points of inflection for $f(x)$ are:

(a) B and D

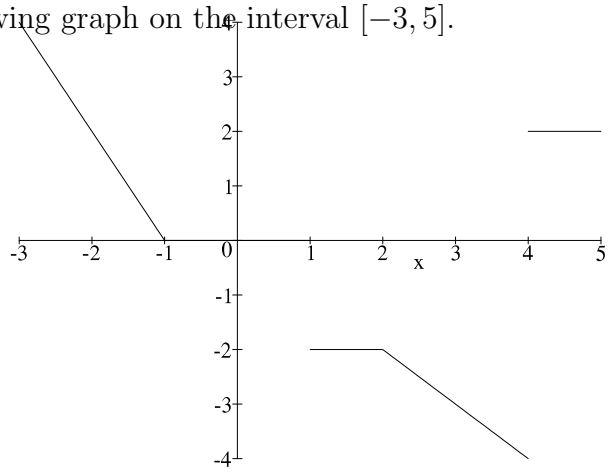
(b) B only

(c) A, C, E

(d) D only

(e) A, B, C, D, and E

15. The function $f(x)$ has the following graph on the interval $[-3, 5]$.



Then, $\int_{-3}^{5} f(x)\,dx =$

(a) 6

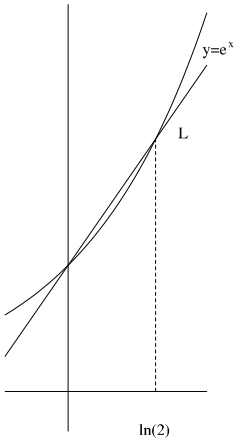
(b) -2

(c) 2

(d) 14

(e) -2

16. An equation for the line L in the following diagram is:



(a) $y = \dfrac{x}{\ln(2)} + 1$

(b) $y = x + \ln(2)$

(c) $y = (\ln(2))x$

(d) $y = 2x + \ln(2)$

(e) $y = \dfrac{x}{\ln(2)} + e^2$

17. For which number x between 0 and 1 is the difference between x and x^3 the greatest?

(a) $\dfrac{\sqrt{3}}{4}$

(b) $\dfrac{1}{\sqrt{2}}$

(c) $\dfrac{1}{e}$

(d) $\ln(2)$

(e) $\dfrac{1}{\sqrt{3}}$

18. If $f(x) = \ln(\sqrt{x})$, then the average rate of change of f on the interval $[3, 7]$ is closest to

    (a) 0.424

    (b) 0.189

    (c) 0.212

    (d) 0.106

    (e) 0.847

19. If Newton's Method is used to solve

$$x^3 + x + 1 = 0$$

    with an initial guess of $x_0 = -1$, then the **first approximation** is closest to:

    (a) -0.682

    (b) -0.686

    (c) -0.750

    (d) -0.696

    (e) -0.816

20. If $\int_0^2 \sqrt{1 + x^2}\, dx$ is approximated by 4 inscribed rectangles of equal width on the x-axis, then this approximation is:

    (a) 2.9485

    (b) 2.6675

    (c) 2.9578

    (d) 2.9765

    (e) 3.2855

END OF MULTIPLE CHOICE SECTION