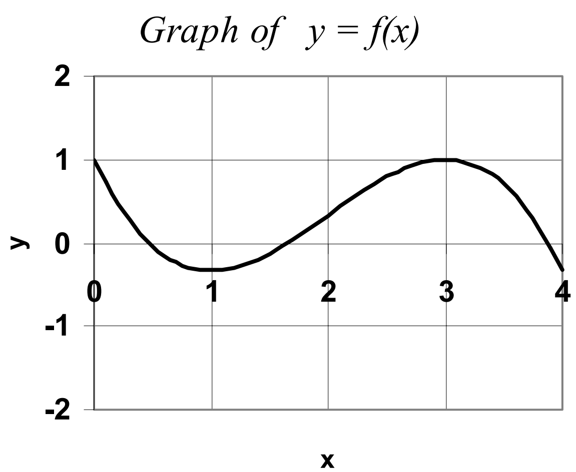
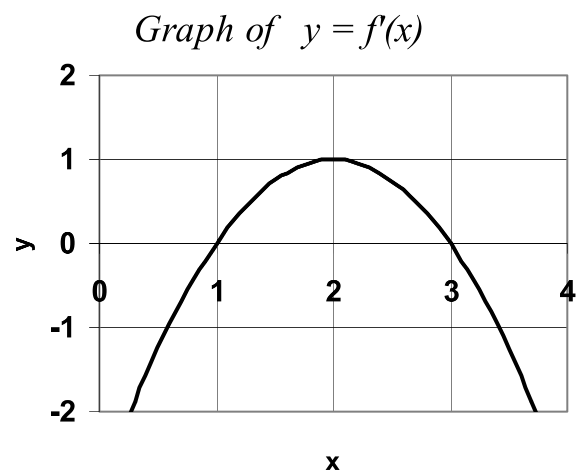
Closed book, closed notes. Calculators are allowed. Work all problems. The first 4 problems are multiple choice. Please circle the correct answer. Only the correct answer will receive credit -- there is no partial credit. Problems 5-9 are free response. Please work the problem in the space provided, and show all work. Partial credit will be given. A correct answer may receive less than full credit if the work is incomplete or incorrect. If you need extra space, work on the back of the pages or on the extra sheet at the end of the exam. Please clearly label all work.

Problems 1 and 2 refer to the figures below. To the left is the graph of the function $f(x)$, while to the right is the graph of the ***derivative*** $f'(x)$.





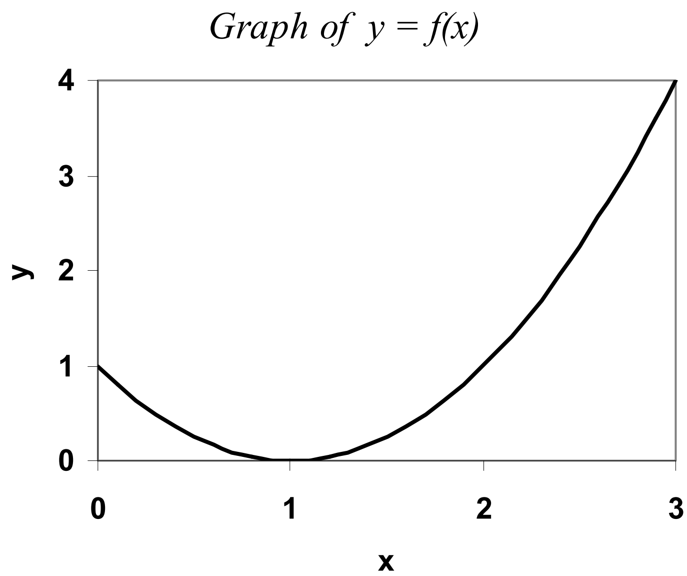
(5) **1.** At $x = 2$, the graph of $y = f(x)$ has a

(a) zero.
(b) local minimum.
(c) local maximum.
(d) inflection point.
(e) None of the above.

(5) **2.** At $x = 3$, the graph of $y = f(x)$ has a

(a) zero.
(b) local minimum.
(c) local maximum.
(d) inflection point.
(e) None of the above.

(5) **3.** To the right is a graph of the function $y = f(x)$.



Which of the following statements is correct for all x shown in the graph?

(a) $f'(x) > 0$.
(b) $f'(x) < 0$.
(c) $f''(x) > 0$.
(d) $f''(x) < 0$.
(e) None of the above.

(5) **4.** If $\int_0^{-1} f(x)dx = -1$ and $\int_{-1}^{2} f(x)dx = 5$, what is $\int_0^2 f(x)dx$?

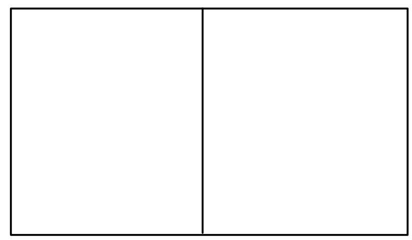
(a) -6
(b) -4
(c) 4
(d) 6
(e) None of the above.

(15) 5. Find all the asymptotes of

$$y = \frac{x^2}{x-3}.$$

For each asymptote, state whether it is horizontal, vertical, or oblique, and justify your answer.

(15) 6. Sven and Ole want to fence a rectangular plot. They also want to use additional fencing to build an internal divider parallel to two outer boundary sections, as shown in the figure below. If they have 240 linear feet of fence, what is the maximum area they can enclose? Verify that your answer yields the global maximum.



(15) 7. Find the **exact value** of the definite integral $\int_{-2}^{0} e^{-2x}\,dx$. Show your work.

(15) 8. Set up but do not evaluate the integral for finding the area of the region bounded by curve $y = x(x-1)$ and the line $x + y = 1$.

(20) 9. Find the following indefinite integrals.

(10) a. $\int \frac{1}{2x+3}\,dx$.

(10) b. $\int \frac{3}{x^3}\,dx$.