Unit 3 Assignment

Work slowly and carefully. If you are having difficulty, go back and review the appropriate *Lesson*.

As your midterm and final exams do not allow calculators, it is best to attempt all questions in this *Assignment* without a calculator.

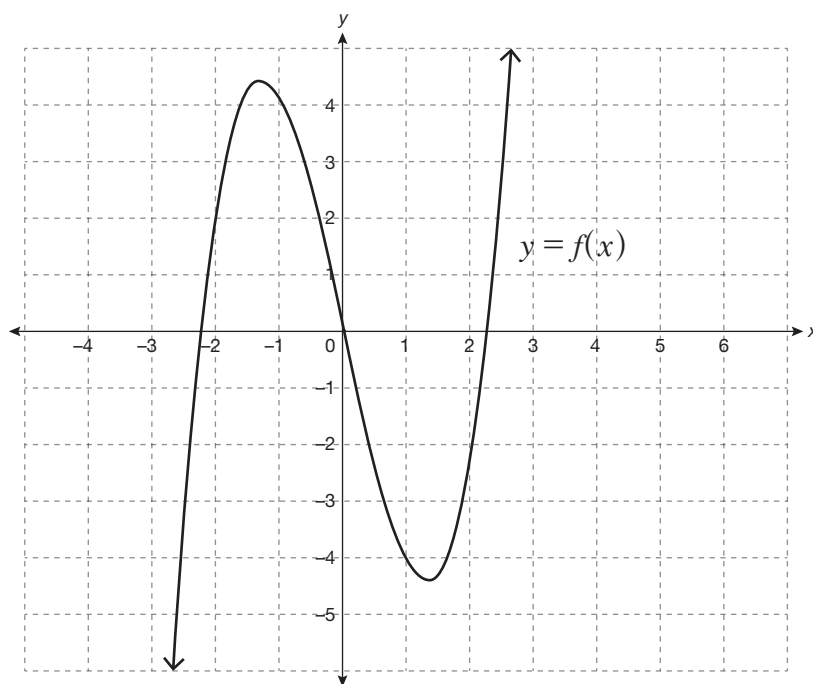Be sure to proofread your assignment carefully.

For full marks, show all calculations, steps, and/or explain your answers.

Total: 75 marks.

1. Determine the type of symmetry, if any, in the following graphs. State whether the function is odd, even, or neither.
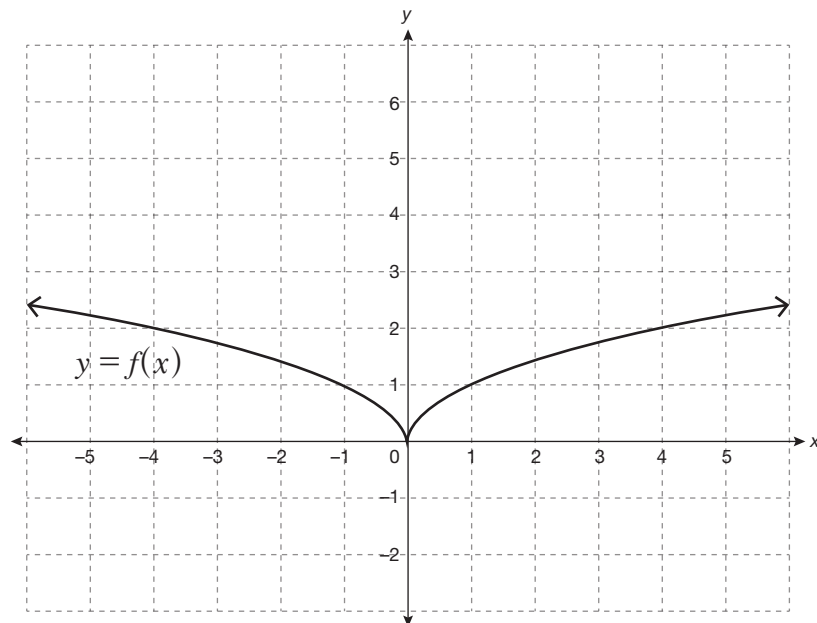
    a.

① 　　b.

2. Determine the type of symmetry, if any, in the following functions. State whether the function is odd, even, or neither.

② 　　a. $f(x) = 3x - x^3$

(2)   b. $f(x) = \sqrt{x+1}$

(2)   c. $f(x) = -\dfrac{x^4}{2}$

3.   Determine the equations of any asymptotes for the following functions.

(3)   a. $f(x) = \dfrac{x(x-2)}{x^2 - 9}$

(3)   b. $f(x) = \dfrac{2x^2 - 5}{x + 1}$

(1)   4. What combinations of vertical, horizontal, and oblique asymptotes are not possible for a rational function?

③   5.   For points A, B, and C on the graph of $y = f(x)$, state whether the function is increasing, decreasing, or has a maximum or minimum. Also state whether the slope of the curve at those points is positive, negative, or zero.
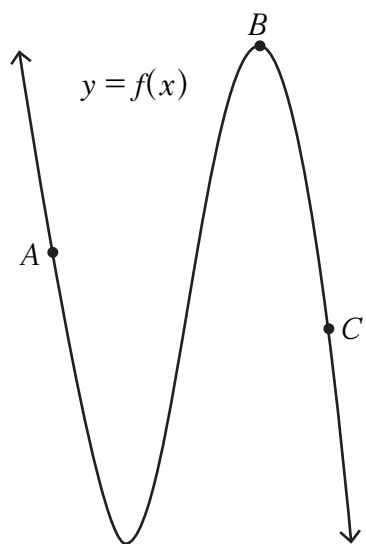
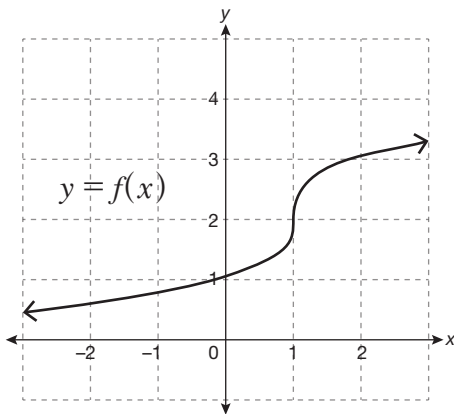6. Find the following characteristics of the graph of the function $f(x) = 3x(x-5)^2$.

(3)   a. Critical point(s)

③   b. Intervals of increase and decrease

②   c. Local extrema

(3)   7.   Find the absolute extrema for the function $f(x) = x^2 - 8x - 1$ on the interval $[1, 10]$.

8.   For the following graph of $y = f(x)$, find where the function

(1)   a.   is increasing

(1)   b.   is concave down

(1)   c.   has inflection point(s)

(2)   9.   Where is the curve $f(x) = x^3 - 8$ concave down?

(2)   10.   Where does $f(x) = x^4 + 2x - 5$ have a point of inflection? Justify.

(5)   11.   Given the function $f(x) = \dfrac{1}{12}x^4 - \dfrac{1}{6}x^3 - x^2 + x - 1$, find the intervals of concavity and the inflection points.

(4) 12. Use the Second Derivative Test to find the local maximum and minimum values of the function $f(x) = 2x^3 + 15x^2 - 36x$.

(1) 13.   Is the following statement true? Explain.

If $f'(2) = f''(2) = 0$, then there must be a point of inflection at $x = 2$.

(3) 14.   Sketch a continuous curve for which each of the following statements is true.
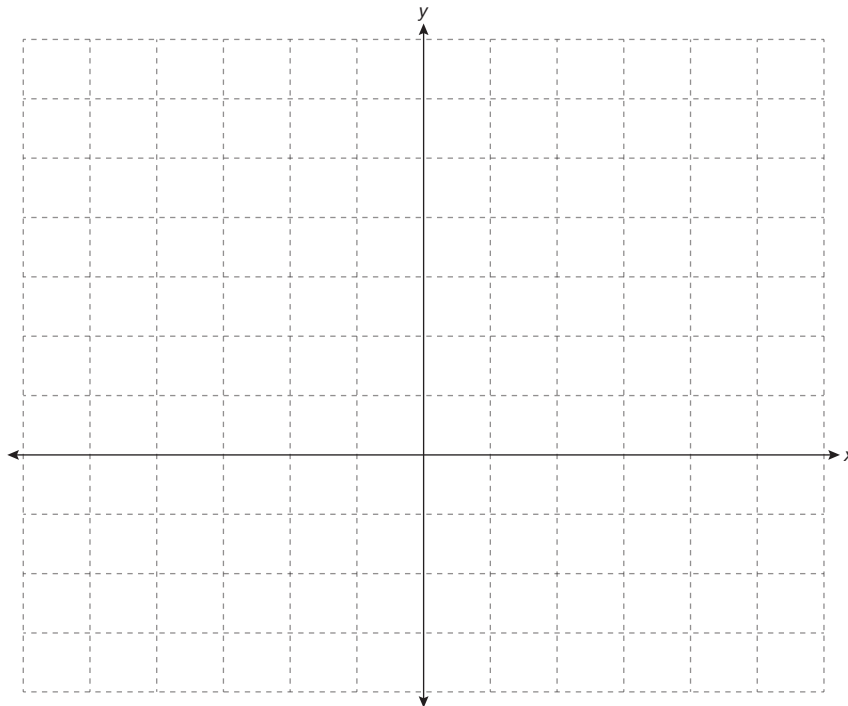
$f(-1) = 4, \ f(0) = 2, \ f(1) = 0$

$f'(-1) = f'(1) = 0$

$f'(x) > 0$ for the interval $(-\infty, -1) \cup (1, \infty)$

$f'(x) < 0$ for the interval $(-1, 1)$

$f''(x) < 0$ for the interval $(-\infty, 0)$

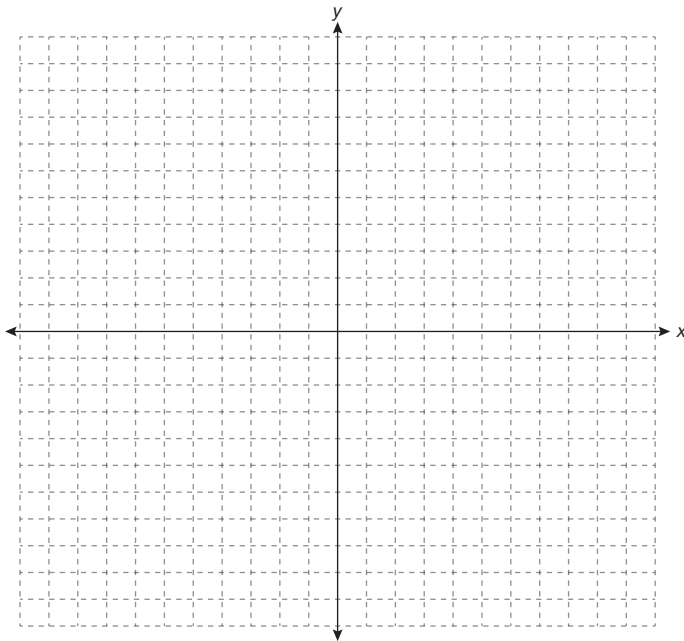$f''(x) > 0$ for the interval $(0, \infty)$

15. Follow the *Steps to Successful Curve Sketching* to sketch the graphs of the following functions.

(13)   a. $f(x) = \dfrac{2}{4 + x}$
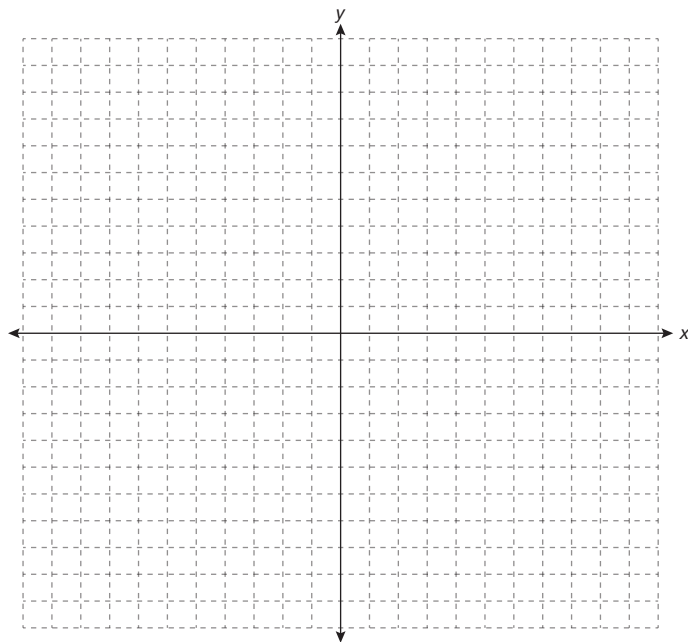
Use the following three pages to show your work.

Summary	
domain	
y-intercept	
asymptotes	
symmetry	
intervals of increase and decrease and critical point(s)	increasing: decreasing: CP:
local extrema	max: min:
concavity and inflection point(s)	down: up: IP:

(13)   b. $f(x) = \dfrac{x^2 + 9}{x}$

Use the following pages to show your work.

Summary	
domain	
y-intercept	
asymptotes	
symmetry	
intervals of increase and decrease and critical point(s)	increasing: decreasing: CP:
local extrema	max: min:
concavity and inflection point(s)	down: up: IP: