COLLEGE ALGEBRA - MAT 140

FALL 2008 - EXAM 3 (v1)

Name : _____

TO RECEIVE FULL CREDIT YOU MUST SHOW YOUR WORK. No notes or books are allowed.

No. 1. (10 points) State whether each statement is **True** or **False** as stated. Provide a clear reason for your answer.

i) The graph of $f(x) = 2x^2 + 3x - 4$ opens down.

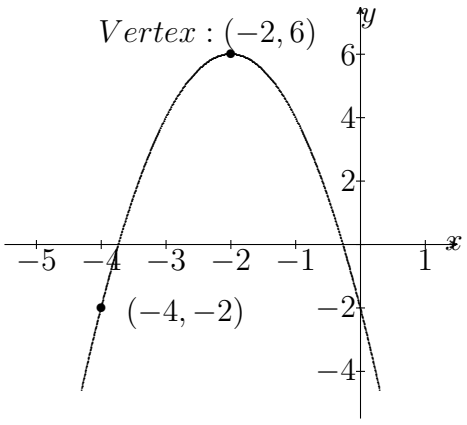
ii) The $x-$intercepts of the graph of a polynomial function are not called turning points.

iii) The functions $R(x) = \dfrac{x^2 - 1}{x - 1}$ and $f(x) = x + 1$ are equal.

iv) The graph of a function will never intersect a horizontal asymptote.

v) The domain of every rational function may not be the set of all real numbers.

No. 2. (8 points) Determine the quadratic function whose graph is given



No. 3. (10 Points) The John Deere company has found that the revenue from sales of heavy-duty tractors is a function of the unit price p (in dollars) that it charges. If the revenue R is

$$R(p) = -\frac{1}{2}p^2 + 1400p.$$

a) Does the revenue function, $R(p)$ have a minimum or maximum value?

b) Find the vertex of the parabola defined by the revenue function, $R(p)$.

c) What unit price should be established to maximize revenue?

d) What is the maximum revenue?

No. 4. (9 points) Determine which functions are polynomial functions. For those that are, state the degree.

(i) $F(x) = \dfrac{x^3 + 8}{x^2}$ (ii) $h(x) = 0.5 - \dfrac{1}{222}x$ (iii) $G(x) = -3x^2(x+2)^2$

No. 5. (4 points) Form a polynomial whose zeros and degree are given.

$$Zeros: \quad 2,\ multiplicity\ 1; \quad -4,\ multiplicity\ 2; \quad degree\ 3$$

No. 6. (12 Points) A farmer has 2400 yards of fence to enclose a rectangular field.

a) Express the amount of fence as a function of the dimensions of the field.

b) Express the area of the rectangular field as as a function of its dimensions.

c) Express the area, A, of the rectangular field as a function of its length.

d) Does the function A obtained in *part (c)* have a maximum or minimum value?

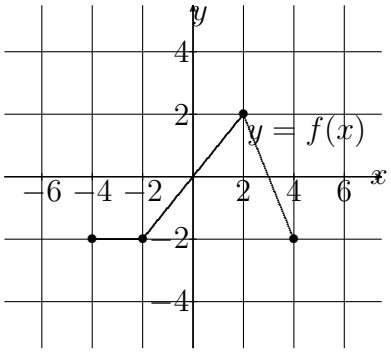
e) What is the vertex of the parabola of the function A obtained in *part (c)*.

f) When does the maximum value of A occur?

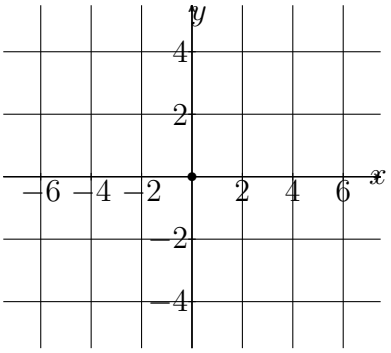
g) What is the maximum value of A?

h) What are the dimensions of the rectangle that encloses the most area?

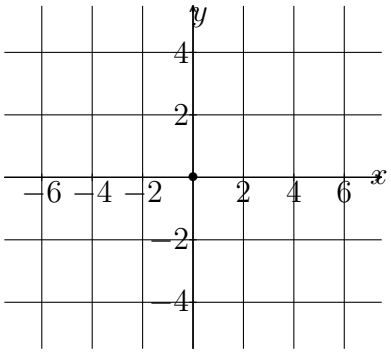
No. 7. (10 points) The graph of the function f is illustrated (Figure 1). Use the graph of f as the first step toward graphing each of the following functions:



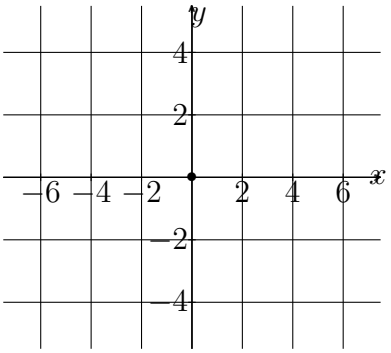
$y = f(x)$



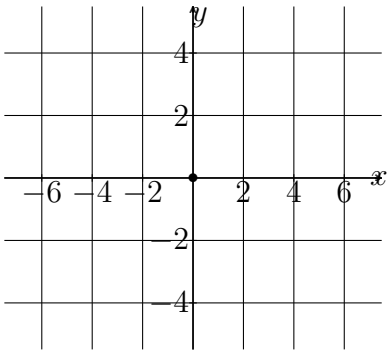
$F(x) = f(x + 3)$



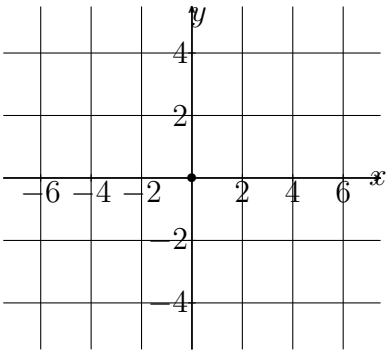
$G(x) = f(x) + 2$



$P(x) = f(-x)$



$G(x) = -f(x)$



$P(x) = -f(3 - x) + 2$

Figure 1:

No. 8. (8 points) Find the vertical, horizontal and oblique asymptotes, if any, of the rational function $R(x) = \dfrac{2x - 4}{x + 5}$.

No. 9. (17 points) For the polynomial: $f(x) = -\frac{1}{2}x^2(x^2 - 4)(x - 5)$

a) Find the degree of the polynomial.

b) Determine the end behavior; that is, find the power function that the graph of f resembles for large values of $|x|$.

c) Find the $x-$ and $y-$intercepts of the graph of f.

d) Determine whether the graph crosses or touches the $x-$axis at each $x-$intercept.

e) Use a graphing utility to determine the number of turning points on the graph of f. Approximate the turning points, if any exist, round to two decimal places.

f) Use the information obtained in parts (a) to (e) to draw a complete graph of f by hand (Figure 2).

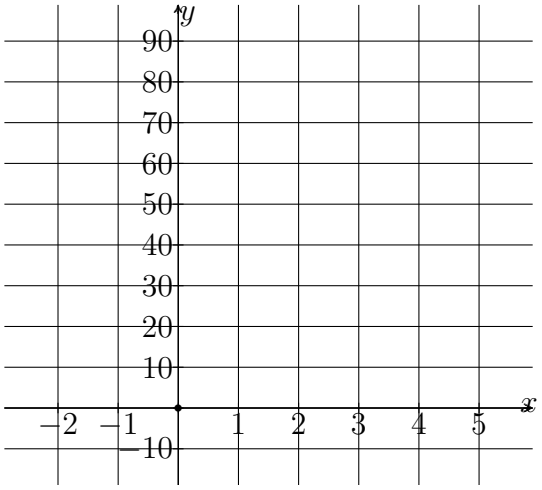


Figure 2:

h) Find the domain of f. Use the graph to find the range of f.

h) Use the graph to determine where f is increasing and where f is decreasing.

No. 10. (8 points) Use the graph (Figure 3), to find:

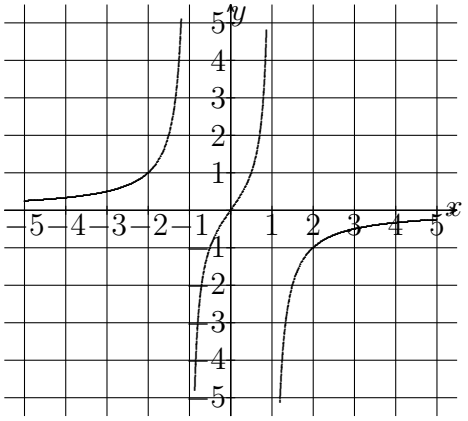


Figure 3:

a) The domain and range of each function.

b) The intercepts if any

c) Horizontal asymptotes. if any.

d) Vertical asymptotes, if any.

e) Oblique asymptotes, if any.

No. 11. (4 points) Find the domain of the rational function $F(x) = \dfrac{-2(x^2-9)}{3(x^2+6x+9)}$.