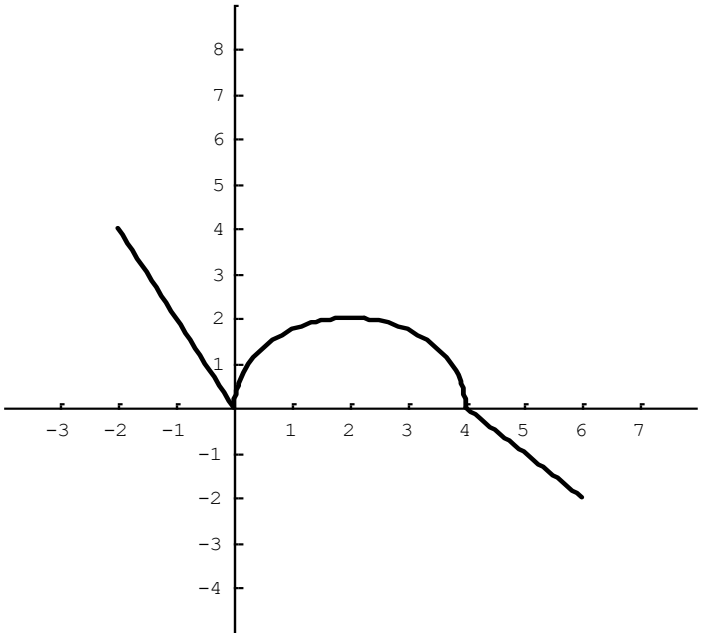
MATH 116 **NAME:**
PRECALCULUS **ID#:**

TAKE HOME EXAM 2

Solve the following problems showing all your work for full credit.

1. The function $y = f(x)$ is given by the graph below.



Sketch the graph of the following functions and determine the domain and the range of each function.

a) (5 pts.) $g(x) = f(x) - 3$

b) (5pts.) $h(x) = f(x + 3)$

2. (4 pts.) A wire of length x is bent into the shape of a circle. Express the area A of the circle as a function of x.

3. (5 pts.) A new workstation costs $10,000. Its useful lifetime is 4 years, at which time it will be worth an estimated $2,000. The company calculates its depreciation using the linear decline method that is an option in the tax laws. Find the linear equation that expresses the value V of the equipment as a function of time $t, 0 \le t \le 4$.

4. For the quadratic function $f(x) = x^2 - 4x + 3$

a) (3 pts.) Find algebraically the exact x, y - intercepts.

b) (4 pts.) Find algebraically the exact coordinates of the vertex.

c) (3 pts.) Sketch the graph of the function and label all special points.

d) (4 pts.) Write the equation of $f(x)$ in *Standard Form* ($f(x) = a(x-h)^2 + k$) and then explain how the graph of $f(x)$ is related to the graph of $y = x^2$.

5. (3 pts.) Write the *Standard Form* ($f(x) = a(x-h)^2 + k$) of the equation of the parabola whose vertex is $(-4,5)$ and passes through the point $(-5,2)$.

6. (4 pts.) The total revenue R earned per day (in dollars) from a pet-sitting service is given by $R(p) = -12p^2 + 150p$, where p is the price charged per unit. Find the unit price that will yield a maximum revenue. What is the maximum revenue?

7. Given the function $f(x) = x^4 - 9x^2$

a) (4 pts.) Find algebraically the real zeros of $f(x)$;

b) (4 pts.) Use the zeroes and the end behavior of polynomial functions to sketch the graph of the function $f(x) = x^4 - 9x^2$. Label all x, y - intercepts.

8. (6 pts.) Find the real zeros of the function $f(x) = x^4 - x^3 - 6x^2 + 4x + 8$ and factor the function completely (use Synthetic Division).

9. Write the complex number in the form $a+bi$

a) (3 pts.) $(6-2i)(1+4i)$

b) (3 pts.) $i^{16}-2i^3+4$

c) (3 pts.) $\dfrac{7-i}{6+i}$

10. Find all real and complex solutions of the equation:

a) (4 pts.) $2x^2-2x+5=0$;

b) (5 pts.) $x^3+27=0$;

11. $P(x)=2x^4-5x^3+20x^2-45x+18$

a) (2 pts.) List all possible rational zeros of $P(x)$;

b) (4 pts.) Find all real and complex zeros.

12. Determine all asymptotes of the function

a) (5 pts.) $f(x) = \dfrac{x^2 - x}{x - 2}$

b) (4 pts.) $f(x) = \dfrac{3x^2 - 5}{x^2 + 3x - 4}$

13. Let $f(x) = \dfrac{x^2 - 4}{x^2 - 1}$.

a) (2 pts.) Determine the domain of the function;

b) (3 pts.) Find the vertical and horizontal asymptotes, if any;

c) (3 pts.) Find the axis intercepts, if any;

d) (2 pts.) Check for any symmetries;

e) (3 pts.) Use the above information to sketch the graph of f.