Name

Date

## Math 10250 Review for Exam 1

- 1. (a) Determine the natural domain of  $f(x) = \frac{2-x}{x-1}$ , find also its inverse g(x). Ans.  $x \neq 1$ ;  $g(x) = \frac{x+2}{x+1}$ (b) What is the natural domain of  $f(x) = \sqrt{3 - 2x}$ ?
- 2. A brand of sunglasses selling for \$50 each has a demand of 1,500 units. However, when the price is increased by \$5, its demand is decreased by 100 units. Find its demand assuming that is a linear function. Ans. q = D(p) = -20p + 2,500
- 3. Complete the square for each quadratic and then sketch its graph.

(i) 
$$f(x) = -3x^2 + 12x$$

(ii) 
$$f(x) = 2x^2 - 12x + 10$$
.



Ans.  $x \leq 3/2$ 

Ans. (i) 
$$f(x) = -3(x-2)^2 + 12$$
; (ii)  $f(x) = 2(x-3)^2 - 8$ 

4. When the price p of a particular computer is 2,000 then the demand x is 50,000 units per week. However, when the price drops by \$500 then the demand rises by 25,000 units. On the cost side, the company making these computers has \$40,000,000 fixed cost and \$600 expenses per unit. Assuming that the demand is linear, find the profit function P in terms of x, and find its maximum value.

Ans.  $P = -0.02x^2 + 2,400x - 40,000,000 = -0.02(x - 60,000)^2 + 32,000,000;$  max value 32,000,000

5. (a)  $\lim_{h \to 0} \frac{5(1+h)^2 - 5}{h} \stackrel{?}{=}$ (b)  $\lim_{h \to 0} \frac{\frac{1}{2+h} - \frac{1}{2}}{h} \stackrel{?}{=}$ 

6. The graph of the function f(x) is given in the next Figure. Which of the following statements is **NOT** true?

(a) 
$$\lim_{x \to a} f(x) = 4$$

- (b)  $\lim_{x \to 4^{-}} f(x) = 2$  and  $\lim_{x \to 4^{+}} f(x) = 0$ (c) f(x) has limit at x = 4.
- (d) f(x) is continuous except at the points x = 2, 4.
- (e)  $\lim_{x \to 0} f(x) = 1.$

7. If  $x \neq 2$  then  $f(x) = \frac{x^2 + 2x - 8}{x - 2}$ . Define f(2) so that f(x) is a continuous function.

8. In which of the following intervals you can be sure that the function  $f(x) = x^4 + 2x^3 - 3x^2 - 2x + 3$  takes the value 2? (i.e the equation f(x) = 2 has a solution.) [-3, -2], [-2, -1], [-1, 0], [0, 1], [1, 2], [2, 3]

Ans. [-3, -2], [-1.0], [0, 1], [1, 2]

Ans. (a) 10; (b)  $-\frac{1}{4}$ 

Ans. f(2) = 6

9. For each function below, find vertical asymptote(s), horizontal asymptote(s), y-intercept, its zero(s), and then sketch its graph. Ans. (a) v.a:  $x = \pm 1$ ; h.a: y = 1; zeros:  $x = \pm 4$ , y-intercept: 16; (b) v.a: x = -1; h.a: y = 0; zeros: None, y-intercept: y = 1

(a) 
$$f(x) = \frac{x^2 - 16}{x^2 - 1}$$
 (b)  $f(x) = \frac{x - 4}{x^2 - 3x - 4}$ 

10. Suppose that you put 100 in an account paying 2% annual interest, compounded daily. How much will Ans. 100  $\left(1 + \frac{0.02}{365}\right)$ ; 100  $\left(1 + \frac{0.02}{365}\right)^2$ ; 100  $\left(1 + \frac{0.02}{365}\right)^3$ you have at the end of 1 day? 2 days? and 3 days?



- 11. Suppose that you have an account paying interest, compounded weekly, that has balance given by  $B(t) = 8000(1.0004)^{52t}$ . What is its principal and annual interest rate?
- 12. \$4,000 is deposited into an account paying q% interest, compounded **annually**. If the account doubles after 10 years, what is q?
- 13. Match the following functions with the given graphs without using your calculator:



14. Match the graphs to the given quadratic functions. Some graphs are redundant.



- 15. A private health club has determined that the number of members depends on the price of a membership, and they are related by an equation of the form q = 3000 20p, where q is the number of members and p is the annual price of a membership. The club has a fixed costs of \$20,000 per year plus an average annual cost of \$40 per member.
  - (a) Write the club's revenue R as a function of the price p.Ans.  $R = 3000p 20p^2$ (b) Write the club's profit P as a function of the price p.Ans.  $P = -20p^2 + 3800p 140000$ (c) What membership price should the club set to maximize its profit?Ans. 895(d) Find the break-even point. Interpret your answer.Ans. 850 and 8140
- 16. Find the equilibrium price  $p_e$  and equilibrium quantity  $q_e$  for each pair of demand and supply functions. Make a sketch of the graphs marking the coordinates of intersection point.

(a) 
$$D(q) = 0.005(q - 100)^2$$
 and  $S(q) = 0.1q + 2$  for  $0 \le q \le 100$   
(b)  $D(p) = \frac{8}{p+1}$  and  $S(p) = \frac{1}{3}p + 1$ 
  
Ans.  $p_e = 3, q_e = 2$