

NAME \_\_\_\_\_

HOMWORK #5, MATH 104, FALL 2008

INSTRUCTIONS: RECORD ANSWERS ON THE HOMEWORK PAGE AND ATTACH ALL WORK ON SEPARATE SHEETS. YOU MUST INCLUDE WORK TO RECEIVE CREDIT FOR PROBLEMS. GIVE ONLY EXACT SOLUTIONS UNLESS OTHERWISE SPECIFIED.

1. SOLVE THE INEQUALITIES BY BUILDING A SIGN DIAGRAM. STATE YOUR SOLUTION IN INTERVAL NOTATION.

A.  $x^3 < x$

B.  $4x^3 + 16x^2 - 9x - 36 < 0$

C.  $\frac{x-2}{x+1} \cdot \frac{x+2}{x-4} \geq 0$

D.  $\frac{x^2 + 6}{5x} \leq 1$

2. USE THE GRAPH OF THE EQUATION TO DETERMINE WHICH INTERVALS SATISFY THE INEQUALITY. STATE YOUR SOLUTION IN INTERVAL NOTATION. EXPLAIN HOW THIS METHOD IS RELATED TO THE SIGN DIAGRAM METHOD.

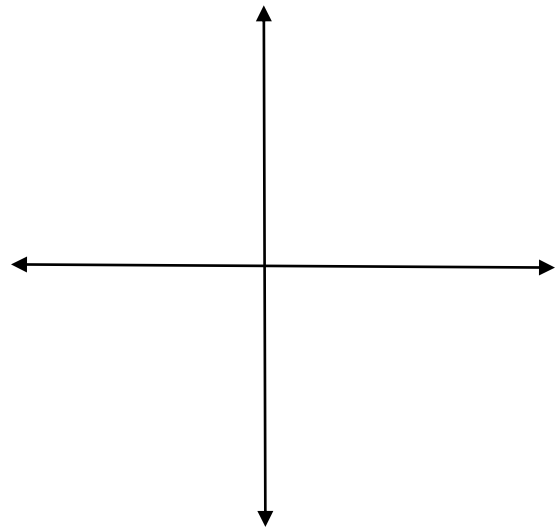
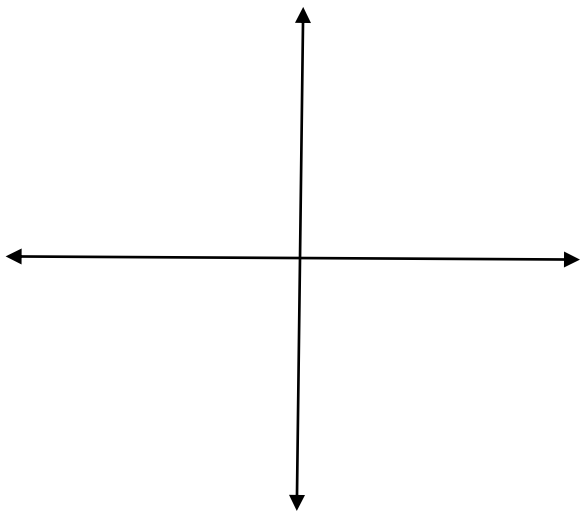
A.  $x(2x - 3)^2 < 0$

B.  $\frac{(2x - 3)^2}{x} < 0$

3. FOR EACH OF THE EQUATIONS BELOW, WRITE THE EQUATION IN STANDARD FORM AND VERTEX FORM. FIND A) THE AXIS OF SYMMETRY, B) THE VERTEX, C) THE X-INTERCEPTS (IF THEY EXIST), D) THE Y-INTERCEPT, E) THE DOMAIN AND RANGE, F) THE SKETCH OF THE GRAPH. LABEL PARTS A-D ON THE GRAPH.

i.  $h(x) = -x - 1^2 - 1$

ii.  $f(x) = 2x^2 - 8x + 11$



4. FOR A CERTAIN COMPANY, THE PROFIT FUNCTION ON THE SALES OF VIRTUAL PETS IS GIVEN BY  $P(x) = -x^2 + 980x - 3000$ . FOR THIS FUNCTION FIND A) THE BREAK-EVEN POINT (I.E. WHEN  $P(x)=0$ ), B) THE NUMBER OF VIRTUAL PETS THAT MUST BE SOLD FOR MAXIMUM PROFIT, AND C) THE VALUE OF THE MAXIMUM PROFIT.

5. USE THE DATA IN THE TABLE BELOW TO MODEL THE AVERAGE MPG DATA FOR U.S. CARS. SHOULD THE EQUATION BE LINEAR OR QUADRATIC? GIVE THE EQUATION PREDICTED FROM THE DATA. USING THE EQUATION, PREDICT THE AVERAGE MPG FOR U.S. CARS IN 2008. FOR YOUR MODEL, LET 1995 BE  $x=0$ .

YEAR (x)	1996	1997	1998	1999	2000	2001
MPG	21.2	21.5	21.6	21.4	22	20.4