

MAT 1140 EXAM 2 A NAME \_\_\_\_\_

SHOW ALL WORK ON THIS TEST OR ON SEPARATE PAPER.

TURN IN ALL WORKSHEETS. CALCULATORS ARE REQUIRED ON THIS TEST.

In 1-5, solve the equations or inequalities graphically.  
Sketch the graph.

1.  $4t^3 - 12t^2 + 8t = 0$

2.  $(X+4)^{\frac{1}{2}} + 5X(X+4)^{\frac{3}{2}} = 0$

3.  $|X^2 - 3| = 2X$

4.  $\frac{X - 5}{3 - X} < 0$  (Give interval notation)

5. If  $h(X) = 6 - 5X^2$ ,

6. Give the domain:

a)  $\frac{h(4) - h(2)}{4 - 2} =$

a)  $f(X) = \sqrt{25 - X^2}$

b)  $\frac{h(X+t) - h(X)}{t} =$

b)  $h(X) = \frac{X}{X^2 - X - 6}$

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7. Given  $g(X) = |X + 2| - |X - 2|$

a) Sketch the graph

b) Determine relative max and mins.

c) Is the function even, odd, or neither?

8. Let  $g(X) = 3 - 2X$

$$h(X) = 3X^2 + 2$$

a)  $(h \circ g)(7)$

b)  $g^{-1}(3)$

9. Given  $f(X) = \sqrt{X^2 - 4}$  for  $X \leq -2$ ,  
find  $f^{-1}(X)$ , sketch  $f(X)$  and  $f^{-1}(X)$ ,

and find the domain and range of  $f^{-1}(X)$ .

10. A group of farmers agree to share equally in the cost of a \$48,000 piece of machinery. If they could find two more farmers to join the group, each person's share would decrease by \$4000. How many farmers are presently in the group?

11. The demand equation for a product is  $p = 42 - \sqrt{0.001X + 2}$ , where  $X$  is the number of units produced per day and  $p$  is the price per unit. Find the demand if the price is set at \$29.95.
12. The revenue for selling  $X$  units of a product is  $R = 125.95X$ . The cost of producing  $X$  units is  $C = 92X + 1200$ . In order to obtain a profit, the revenue must be greater than the cost. For what values of  $X$  will this product return a profit?
13. The velocity of a ball thrown vertically upward is given by  $v(t) = -32t + 48$ , where  $t$  is the time in seconds and  $v$  is the velocity in feet per second.
- Find the velocity when  $t=1$ .
  - Find the velocity when  $t=2$ .
  - Find the time when the ball reaches maximum height.  
(Hint: velocity = \_\_\_\_ at the maximum height!)

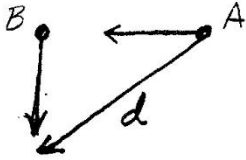
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14. At noon, ship A was 100 miles due east of ship B. Ship A is sailing west at 12 miles per hour, and ship B is sailing south at 10 miles per hour.

a) Show that the distance between the ships is given by

$$d = \sqrt{(100 - 12t)^2 + (10t)^2}, \text{ where } t \text{ is the time in hours}$$

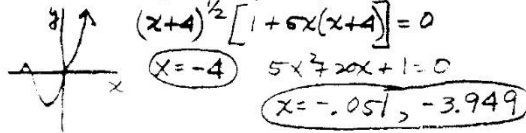
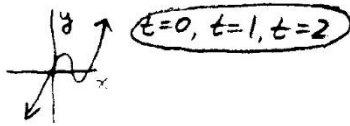
with  $t=0$  corresponding to noon.



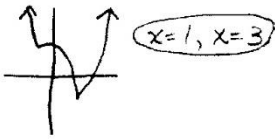
b) Graph this distance function, and find the minimum distance between the ships. At what time does this occur? Sketch the graph. What range values did you use?

**MAT 1140 EXAM 2A Solutions**

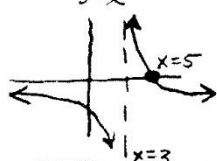
1.  $y = 4t^3 - 12t^2 + 8t = 0$     2.  $y = (x+4)^{\frac{1}{2}} + 5x(x+4)^{\frac{3}{2}} = 0$     D:  $x \geq -4$



3.  $y = |x^2 - 3| - 2x = 0$



4.  $y = \frac{x-5}{3-x} < 0$



5.  $h(x) = 6 - 5x^2$

a)  $h(4) = 6 - 80 = -74$      $h(2) = 6 - 20 = -14$

$\frac{h(4) - h(2)}{4 - 2} = \frac{-74 + 14}{2} = -30$

b)  $h(x+t) = 6 - 5(x+t)^2 = 6 - 5x^2 - 10xt - 5t^2$

$\frac{h(x+t) - h(x)}{t} = \frac{6 - 5x^2 - 10xt - 5t^2 - (6 - 5x^2)}{t} = \frac{-10xt - 5t^2}{t} = -5(2x+t) = -5(2x+10)$

6a)  $f(x) = \sqrt{25 - x^2}$

$25 - x^2 \geq 0$

$x^2 - 25 \leq 0$

$[-5, 5]$

d)  $h(x) = \frac{x}{x^2 - x - 6}$

$x^2 - x - 6 \neq 0$

$(x-3)(x+2) \neq 0$

All  $x \neq 3$   $x \neq -2$

7.  $g(x) = |x+2| - |x-2|$



a) Max = 4, Min = -4

c) odd, because

$g(-x) = |-x+2| - |-x-2| = g(x)$

8.  $g(x) = 3 - 2x$      $h(x) = 3x^2 + 2$

a)  $g(7) = 3 - 14 = -11$

$(h \circ g)(7) = h(g(7))$

$= h(-11) = 3(-11)^2 + 2 = 365$

b)  $y = g(x) = 3 - 2x$

$x = 3 - 2y$

$2y = 3 - x$

$y = g^{-1}(x) = \frac{3-x}{2}$

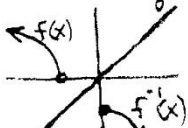
$g^{-1}(3) = \frac{3-3}{2} = 0$

9.  $f(x) = \sqrt{x^2 + 4}$ ,  $x \leq -2$  Symm about origin.

D:  $(-\infty, -2]$

R:  $[0, \infty)$

Left half only!



$y = \sqrt{x^2 + 4}$

$x = \sqrt{y^2 - 4}$

$x^2 = y^2 - 4$

$y^2 = x^2 + 4$

$y = \pm \sqrt{x^2 + 4}$

$f^{-1}(x) = y = -\sqrt{x^2 + 4}$  Lower half only!    D:  $[0, \infty)$     R:  $(-\infty, -2)$

10. Let  $X =$  no. of farmers.

Cost for each =  $\frac{48,000}{X}$

$\frac{48,000}{X} - \frac{48,000}{X+2} = 4,000$

Asymptotes at  $x=0, x=-2$

Roots  $(x=4)$  (also  $x=-6$ ).

11.  $p = 42 - \sqrt{0.001x + 2}$

$29.95 = 42 - \sqrt{0.001x + 2}$

$\sqrt{0.001x + 2} = 12.05$

$0.001x + 2 = 145.2025$

$x = 143, 202.5$

13a) 16 ft/sec

b) -16 ft/sec

c)  $\frac{3}{2}$  sec



12.  $P = R - C > 0$

$125.95x - (92x + 1200) > 0$

$33.95x > 1200$

$x > 35.346$      $x \geq 36$

14.  $y = \sqrt{(100 - 12t)^2 + (10t)^2}$

$f_{min} = 4.91$  hrs.

$y = 64.0184$  mi.

Range  $x = 0 \leq 10$      $y = 0$  to  $200$