

CONCORDIA UNIVERSITY

Department of Mathematics & Statistics

Instructor: U. Tiwari MIDTERM TEST: Math 206/1 AA TIME: 75 minutes Date: May 25, 17

MARKS

1. Simplify the expressions below. Do not use a calculator.

[9] (a) $\sqrt{125} + \sqrt{27} + \sqrt{12}$ (b) $2x(x^3 + 2x - 5) + 2x^2(-x^2 + 3x + 1)$ (c) $\frac{2t+8}{(t^2-16)}$

[9] 2. Factor the polynomials completely.

(a) $x^5 + 6x^4 + 9x^3$ (b) $2x^4 - 32$ (c) $6x^2 - 11x - 10$

[8] 3. (a) Use synthetic division to divide $x^5 - 5x^3 + 10$ by $x + 1$.

(b) Perform the arithmetic operation and simplify: $\frac{1}{x^2-3x+2} - \frac{1}{x-2}$

[8] 4. Solve the following:

(a) $\frac{4}{(2x-1)^2} + \frac{12}{2x-1} + 9 = 0$

(b) $|1 - 4x| - 7 < -2$

[8] 5. (a) Which of the points A(2, 4), B(1, -3) is closer to the point C(3, 0)?

(b) Show that the equation $x^2 + y^2 + 6x - 2y + 1 = 0$ represents a circle. Find coordinates of the center and the radius of the circle.

[8] 6. How much water must be evaporated from 240 gallons of a 3% salt solution to produce a 5% salt Solution?

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Solution.

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1 (a) $\sqrt{125} + \sqrt{27} + \sqrt{12}$
 $= \sqrt{25 \cdot 5} + \sqrt{9 \cdot 3} + \sqrt{4 \cdot 3}$
 $= \sqrt{25} \sqrt{5} + \sqrt{9} \sqrt{3} + \sqrt{4} \sqrt{3} = 5\sqrt{5} + 5\sqrt{3}$

(b) Multiply and simplify:
 $2x(x^3 + 2x - 5) + 2x^2(-x^2 + 3x + 1)$
 $= 2x^4 + 4x^2 - 10x - 2x^4 + 6x^3 + 2x^2$
 $= 6x^3 + 6x^2 - 10x$

(c) $\frac{2t+8}{(t^2-4^2)} = \frac{2(t+4)}{(t+4)(t-4)} = \frac{2}{t-4}$

#2. Factor Completely:

(a) $x^5 + 6x^4 + 9x^3 = x^3(x^2 + 6x + 9)$
 $= x^3(x+3)^2$

(b) $2x^4 - 32 = 2(x^4 - 16) = 2[(x^2)^2 - 4^2]$
 $= 2(x^2 - 4)(x^2 + 4) = 2(x^2 - 2^2)(x^2 + 4)$
 $= 2(x-2)(x+2)(x^2 + 4)$

(c) $6x^2 - 11x - 10$
 $= (3x+2)(2x-5)$

#3.

(a) Synthetic division: Divide $x^5 - 5x^3 + 10$ by $x+1$

$$\begin{array}{r|rrrrrr} -1 & 1 & 0 & -5 & 0 & 0 & 10 \\ & & -1 & -1 & 4 & -4 & 4 \\ \hline & 1 & -1 & -4 & 4 & -4 & 14 \text{ Rem.} \end{array}$$

quotient $Q(x) = x^4 - x^3 - 4x^2 + 4x - 4$
 Remainder = 14.

(b) $\frac{1}{x^2 - 3x + 2} - \frac{1}{x-2} = \frac{1}{(x-1)(x-2)} - \frac{1}{x-2}$
 $= \frac{1}{(x-1)(x-2)} - \frac{x-1}{(x-1)(x-2)}$
 $= \frac{1 - (x-1)}{(x-1)(x-2)} = \frac{2-x}{(x-1)(x-2)}$
 $= \frac{-(x-2)}{(x-1)(x-2)} = -\frac{1}{x-1} = \frac{1}{1-x}$

#4 solve for x.

" $\frac{4}{(2x-1)^2} + \frac{12}{2x-1} + 9 = 0$ Multiply both sides by $(2x-1)^2$
 $4 + 12(2x-1) + 9(2x-1)^2 = 0$ Assume $2x-1 \neq 0$
 Replace $(2x-1)$ by T

$9T^2 + 12T + 4 = 0$
 $(3T+2)^2 = 0 \Rightarrow 3T+2 = 0$

$3(2x-1)+2 = 0 \Rightarrow 6x-1 = 0$
 $x = \frac{1}{6}$ ANS.

(b) $|1-4x| - 7 < -2 \Rightarrow |1-4x| < 5$

or $-5 < 1-4x < 5$

$-5-1 < -4x < 5-1$

$-6 < -4x < 4$

Divide by -4

$\frac{3}{2} > x > -1$ or $-1 < x < \frac{3}{2}$
 ANS. 2.

(b) Distance = $\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$
 distance: A(2,4) to C(3,0)

(a) $= \sqrt{(3-2)^2 + (0-4)^2} = \sqrt{1+16} = \sqrt{17}$

distance B(1,3) to C(3,0)

$= \sqrt{2^2 + (-3)^2} = \sqrt{13} < \sqrt{17}$

Point B is closer to C.

(b) $(x^2 + 6x) + (y^2 - 2y) = -1$
 Complete squares

$(x^2 + 6x + 3) + (y^2 - 2y + 1) = -1 + 9 + 1$

$(x+3)^2 + (y-1)^2 = 3^2$

Circle (-3,1) rad = 3.

Let x gallons be required for 5% . $0.05x = 240 \times 0.03$

$x = 144$ Gallons must be left

Amount Evaporated = $240 - 144 = 96$ Gal.