Section 4.3 — Dr. ZABOROWSKI

#25) $x^4 > x^2$

$x^4 - x^2 > 0 \Rightarrow x^2(x^2-1) > 0$

Critical points: $x^2 = 0$ | $x^2 - 1 = 0$

$x = 0$ | $x = \pm 1$

x	$-\infty$	-1	0	1	$+\infty$
$x^2(x^2-1)$	$+$	0	$-$	0	$+$

every region

Sol. Set $x \in (-\infty, -1) \cup (1, +\infty)$.

#30) $x^3 > 1$

$x^3 - 1 > 0$

$(x-1)(x^2+x+1)$; I used $a^3 - b^3 = (a-b)(a^2+ab+b^2)$

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

Critical Points: $x - 1 = 0$ | $x^2 + x + 1 = 0$

$x = 1$ | $x = \frac{-1 \pm \sqrt{1 - 4 \times 1 \times 1}}{2} = \frac{-1 \pm \sqrt{3}\, i}{2}$

$\Rightarrow$ Imaginary Roots

x	$-\infty$	1	$+\infty$
(x^3-1)	$-$	0	$+$

Try Test points in every of the two regions.

Sect 4.5

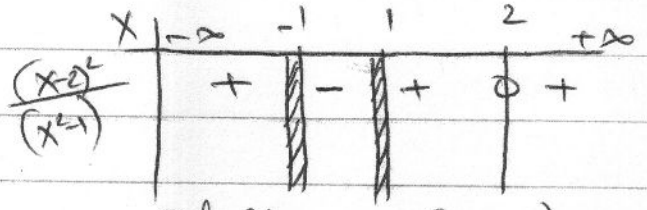
Dr. BADAWI

#35) $\frac{(x-2)^2}{x^2-1} \geq 0$; Rational function

Critical Points: $(x-2)^2 = 0$ | $x^2-1=0$

$x-2=0$ | $x^2=1$

$x=2$ | $x=\pm 1$; Undefined at $x=\pm 1$



Try Test Points in every region.

Sol Set $x \in (-\infty, -1) \cup (1, \infty)$

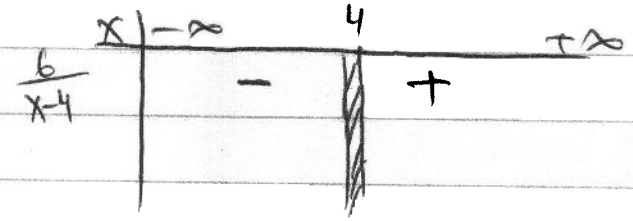
#40) $\frac{x+2}{x-4} \geq 1 \longrightarrow \frac{x+2}{x-4} - \frac{1}{1} \geq 0$

$\frac{x+2-(x-4)}{x-4} \geq 0$

$\frac{6}{x-4} \geq 0$

Critical Points: $x-4=0$

$x=4$



Try Test Points in each of the two regions

Sol Set $x \in (4, +\infty)$.

Section 1.5 D. ZABDAWI

+4

$$\frac{2x+5}{x+1} > \frac{x+1}{x-1}$$

$$\frac{2x+5}{x+1} - \frac{x+1}{x-1} > 0$$

$$\frac{(x-1)(2x+5) - (x+1)(x+1)}{(x+1)(x-1)} > 0$$

$$\frac{2x^2+3x-5 - (x^2+2x+1)}{(x+1)(x-1)} > 0$$

$$\frac{x^2+x-6}{(x+1)(x-1)} > 0$$

$$\frac{(x+3)(x-2)}{(x+1)(x-1)} > 0$$

Critical Points. $(x+3)(x-2)=0$ | $(x+1)(x-1)=0$

$x = -3, 2$ | $x = \pm 1$

x	$-\infty$		-3		-1		1		2		$+\infty$
$\frac{(x+3)(x-2)}{(x+1)(x-1)}$		+	0	−	‖	+	‖	−	0	+	

Sol. Set $x \in (-\infty, -3) \cup (-1, 1) \cup (2, +\infty)$

Section 4.5 — D. ZABDAWI

#50) $\dfrac{(2-x)^3(3x-2)}{(x^3+1)} < 0$

Critical Points: $(2-x)^3(3x-2)=0$ | $x^3+1=0$

$(2-x)^3=0$ | $3x-2=0$ | $(x+1)(x^2-x+1)=0$

$2-x=0$ | $3x=2$ | I used $a^3+b^3=(a+b)(a^2-ab+b^2)$

$x=2$ | $x=2/3$

So for $x^2+1=0$

$(x+1)(x^2-x+1)=0$

$x+1=0$ | $x^2-x+1=0$

$x=-1$ | $x=\dfrac{1\pm\sqrt{1-4\cdot1\cdot1}}{2}=\dfrac{1\pm\sqrt{3}i}{2}$

→ 2 Imaginary Roots

Actually when you have $x^3+1=0$

$x^3=-1$

$x=\sqrt[3]{-1}=-1$

you'll know that the other two roots are imaginary.

x	$-\infty$		-1		$2/3$		2		$+\infty$
$\frac{(2-x)^3(3x-2)}{(x^3+1)}$		$+$	‖	$-$	0	$+$	0	$-$	

Sol. set $x\in(-1,2/3)\cup(2,+\infty)$