

### Quiz 6

This quiz is graded out of 10 marks. No books, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. (10 marks) pg. 712 #27 Sketch the function  $f(x) = 4x^3 - 24x^2 + 36x$  using the method shown in class.

x-intercept:

$$\begin{aligned} 0 &= f(x) \\ 0 &= 4x^3 - 24x^2 + 36x \\ 0 &= 4x(x^2 - 6x + 9) \\ 0 &= 4x(x-3)^2 \end{aligned}$$

∴ x-int 0, 3  
 @ (0,0), (3,0)

y-intercept:

$$(0, f(0)) = (0, 0)$$

Rel. min / max:

Critical point:

$$\begin{aligned} f'(x) &= 12x^2 - 48x + 36 \\ 0 &= f'(x) \\ 0 &= 12x^2 - 48x + 36 \\ 0 &= x^2 - 4x + 3 \\ 0 &= (x-3)(x-1) \end{aligned}$$

$\begin{array}{cc} | & | \\ x=3 & x=1 \end{array}$

	$(-\infty, 1)$	$(1, 3)$	$(3, \infty)$
test point, p	0	2	4
$f'(p)$	36 (+)	-12 (-)	36 (+)
inc/dec	↗	↘	↗

∴ rel. max @  $x=1$   
 $y = f(1) = 4(1)^3 - 24(1)^2 + 36 = 16$   
 ∴ rel max @ (1, 16)  
 ∴ rel. min @  $x=3$   
 $y = f(3) = 0$   
 ∴ rel min @ (3, 0)

# Inflection points:


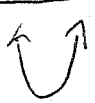
$$f''(x) = 24x - 48$$

$$0 = f''(x)$$

$$0 = 24x - 48$$

$$48 = 24x$$

$$2 = x$$

	$(-\infty, 2)$	$(2, \infty)$
test point, $p$	0	3
$f''(p)$	$-48 \ominus$	$24 \oplus$
Concavity		

∴ inflection point  
at  $x=2$

$$\begin{aligned} y &= f(2) \\ &= 4(2)(2-3)^2 \\ &= 8 \end{aligned}$$

∴ inflection point  
at  $(2, 8)$

