

201 S4.3#s 1, 4, 7, 10, 13, 19, 22, 25, 28, 33, 39

41ab, 46ab, 50ab, 53a, 56a

#s 1-4 (a) c.p.'s?

b) Inc/Dec?

c) local max/min?

①  $f'(x) = x(x-1) \stackrel{\text{SET}}{=} 0 \Rightarrow$

(a)  $x \in \{0, 1\}$



inc:  $(-\infty, 0) \cup (1, \infty)$

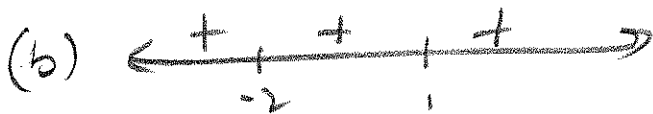
dec:  $(0, 1)$

(c) Max  $\textcircled{a}$   $x=0$

Min  $\textcircled{a}$   $x=1$

④  $f'(x) = (x-1)^2(x+2)^2$

(a)  $\stackrel{\text{SET}}{=} 0 \Rightarrow x \in \{-2, 1\}$



inc:  $(-\infty, \infty)$

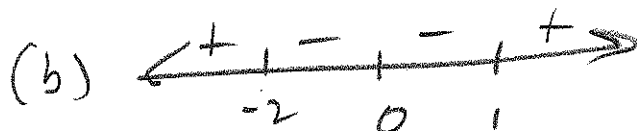
(c) No extrema

⑦  $f'(x) = \frac{x^2(x-1)}{x+2}, x \neq -2$

(a)  $\stackrel{\text{SET}}{=} 0 \Rightarrow x \in \{0, 1\}$

$x+2 \stackrel{\text{SET}}{=} 0 \Rightarrow x = -2$

c.p.'s:  $x \in \{-2, 0, 1\}$



inc:  $(-\infty, -2) \cup (1, \infty)$

dec:  $(-2, 1)$

(c) min  $\textcircled{a}$   $x=1$

⑩  $f'(x) = 3 - \frac{6}{\sqrt{x}}, x \neq 0$

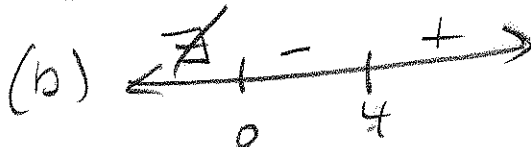
$f'(x) = \frac{3\sqrt{x} - 6}{\sqrt{x}} \stackrel{\text{SET}}{=} 0$

$3\sqrt{x} = 6$

$\sqrt{x} = 2$

$x = 4$

(a) c.p.'s:  $x \in \{0, 4\}$



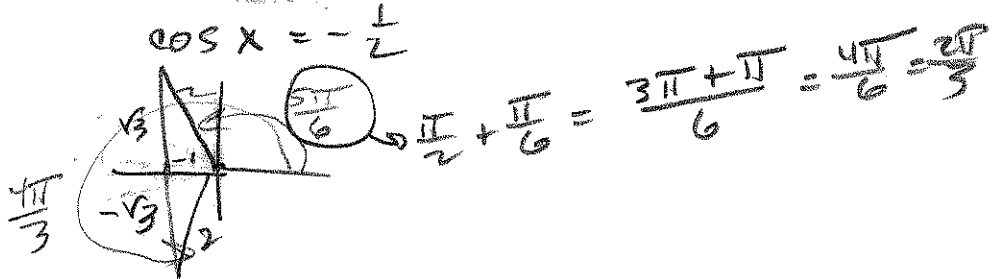
(c) min  $\textcircled{a}$   $x=4$

201  $\{4, 3, 13, 19, 22, 25, 28, 33, 38, 41, 46, 50, 53, 56\}$

(13)  $f'(x) = (\sin x - 1)(2\cos x + 1), 0 \leq x \leq 2\pi$

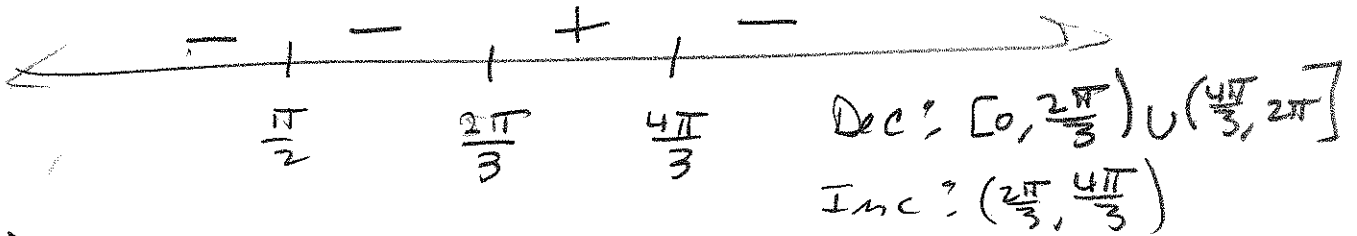
(a)  $\sin x = 1 \quad 2\cos x + 1 = 0$

$x = \frac{\pi}{2}$

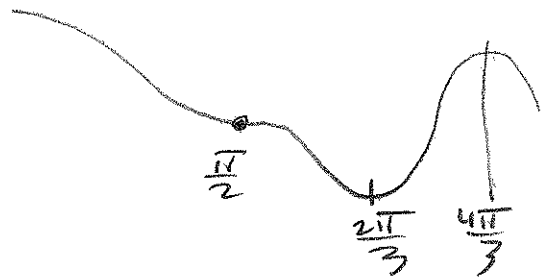


(a) cp's:  $x = \frac{\pi}{2}, \frac{2\pi}{3}, \frac{4\pi}{3}$

(b)  $(\sin(0) - 1)(2\cos(0) + 1) = (-1)(3) < 0$



(c) Max:  $\frac{4\pi}{3} = x$   
 Min:  $x = \frac{2\pi}{3}$



#s 15-40

(a) inc/dec.

(b) max/min values and locations  
 y-val x-val

201 \$4, 3, 19, 22, 25, 28, 33, 38, \underbrace{41, 46, 50}\_{25}, \underbrace{53, 56}\_{2}\$

(19)  $g(t) = -t^2 - 3t + 3$

(a)  $g'(t) = -2t - 3 \stackrel{\text{SET } 0}{=}$

$t = -\frac{3}{2}$



inc:  $(-\infty, -\frac{3}{2})$

dec:  $(-\frac{3}{2}, \infty)$

(b)  $g(-\frac{3}{2}) = -(-\frac{3}{2})^2 - 3(-\frac{3}{2}) + 3$   
 $= -\frac{9}{4} + \frac{9}{2} + \frac{6}{2} = \frac{9}{4} + \frac{12}{4} = \frac{21}{4}$

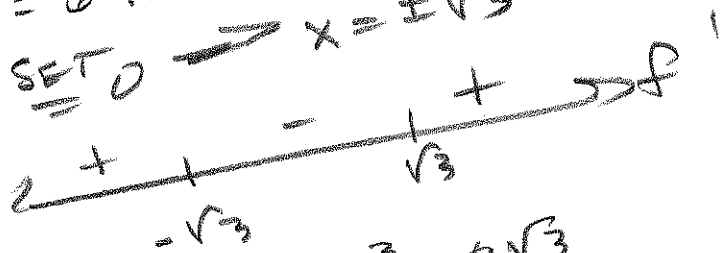
max of  $y = \frac{21}{4}$  @  $x = -\frac{3}{2}$

(22)  $h(x) = 2x^3 - 18x$

(a)  $h'(x) = 6x^2 - 18$

$= 6(x^2 - 3) = 6(x - \sqrt{3})(x + \sqrt{3})$

SET 0  $\Rightarrow x = \pm\sqrt{3}$



$h(\sqrt{3}) = 2(\sqrt{3})^3 - 18\sqrt{3}$

$= 2(3)\sqrt{3} - 18\sqrt{3}$

$= (6 - 18)\sqrt{3} = -12\sqrt{3}$

min of  $y = -12\sqrt{3}$  @  $x = \sqrt{3}$

max of  $y = 12\sqrt{3}$  @  $x = -\sqrt{3}$

201  $\$4, 3 \# \$25, 28, 32, 38, \underbrace{41, 46, 50}_{25}, \underbrace{53, 56}_{2}$

(25)  $f(r) = 3r^3 + 16r$

(a)  $f'(r) = 9r^2 + 16$

Inc:  $\mathbb{R}$

Dec:  $\emptyset$

(b) No extrema

(28)  $g(x) = x^4 - 4x^3 + 4x^2$

(a)  $g'(x) = 4x^3 - 12x^2 + 8x$

$\text{set } 0 \Rightarrow 4x(x^2 - 3x + 2) = 0$

$\Rightarrow 4x(x-2)(x-1) = 0$

$\Rightarrow x \in \{0, 1, 2\}$



Inc:  $(0, 1) \cup (2, \infty)$

Dec:  $(-\infty, 0) \cup (1, 2)$

(b)  $g(0) = 0$  Min of 0 @  $x=0$

$g(1) = 1$  Max of 1 @  $x=1$

$g(2) = 0$  Min of 0 @  $x=2$

2	1	-4	4	0	0
		2	-4	0	0
		1	-2	0	0

(32)  $g(x) = 4x^{\frac{1}{2}} - x^2 + 3$

(a)  $g'(x) = 2x^{-\frac{1}{2}} - 2x$

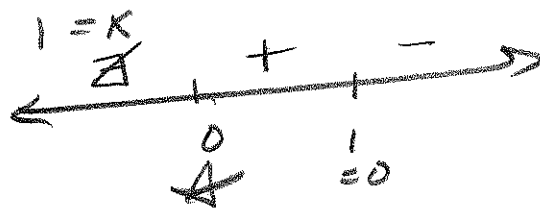
$= \frac{2 - 2x^{\frac{3}{2}}}{x^{\frac{1}{2}}}$

$\text{set } 0 \rightarrow$

$2 = 2x^{\frac{3}{2}}$   
 $1 = x^{\frac{3}{2}}$

$\text{set } x^{\frac{1}{2}} = 0 \Rightarrow$

$x = 0$



$g(0) = 3$

$g(1) = 6$

Inc:  $(0, 1)$

Dec:  $(1, \infty)$

(b) Abs max:

$y = 6$  @  $x = 1$   
(Also local max)

Local min:

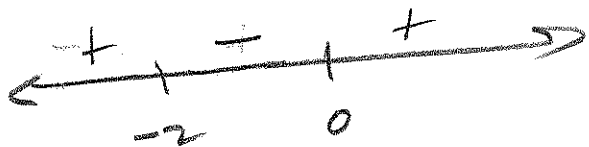
$y = 3$  @  $x = 0$

201 §4.3 #s 38, 41, 46, 50, 53, 56  
 $\underbrace{41, 46, 50}_{2b}$ ,  $\underbrace{53, 56}_{2b}$

(38)  $g(x) = x^{2/3}(x+5)$   
 $= x^{5/3} + 5x^{2/3} \rightarrow$

(2)  $g'(x) = \frac{5}{3}x^{2/3} + \frac{10}{3}x^{-1/3}$   
 $= \frac{5x + 10}{3x^{1/3}} \stackrel{\text{SET}}{=} 0 \rightarrow$

$x = -2$        $\stackrel{\text{SET}}{=} \frac{5x + 10}{3x^{1/3}} = 0 \rightarrow$   
 $x = 0$



Inc:  $(-2, \infty)$

Dec:  $(-\infty, -2)$

(b)  $g(0) = 0$   
 $g(-2) = (-2)^{2/3}(-2+5)$   
 $= 4^{1/3}(3)$

Min:  $y = 0$  @  $x = 0$

Max:  $y = 3 \cdot 4^{1/3}$  @  $x = -2$

~~#s~~ 41-52

(2) Find local extrema and where they occur.  
 (b) which are absolute?

(41)  $f(x) = 2x - x^2$  on  $(-\infty, 2]$

(2)  $f'(x) = 2 - 2x \stackrel{\text{SET}}{=} 0$

$\Rightarrow x = 1$



$f(1) = 1$

Local max of  $y = 1$  @  $x = 1$

$f(2) = 0 \Rightarrow$  local min.

(b)  $f(1) = 1 \Rightarrow$  abs. max.

201  $\int 4.3$  ~~is~~  $46.50$ ,  $53.50$   
 $\underbrace{\quad}_{21}$   $\underbrace{\quad}_2$

(46)  $f(t) = t^3 - 3t^2, t \in (-\infty, 3]$

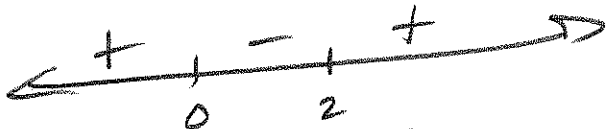
(a)  $f'(t) = 3t^2 - 6t \stackrel{\text{SET}}{=} 0 \Rightarrow$

$3t(t-2) = 0 \Rightarrow$

$t \in \{0, 2\}$

~~is~~  $53-60$

(a) Find local extrema and where they occur.



$f(0) = 0$  local max

$f(2) = -4$  " min

$f(3) = 0$  " max

(53)  $f(x) = \sin(2x)$  on  $[0, \pi]$

(a)  $f'(x) = 2\cos(2x) \stackrel{\text{SET}}{=} 0$

$\Rightarrow \cos(2x) = 0$

$\rightarrow 2x = \frac{\pi}{2}, \frac{3\pi}{2}$

$\Rightarrow x = \frac{\pi}{4}, \frac{3\pi}{4}$

(b)  $f(3) = 0$  is Absolute Max on  $(-\infty, 3)$

(50)  $f(x) = \sqrt{x^2 - 2x - 3}, f(\frac{\pi}{4}) = \sin(\frac{2\pi}{4}) = 1$

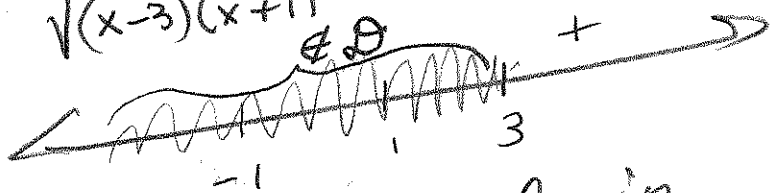
$f(\frac{3\pi}{4}) = \sin(\frac{3\pi}{2}) = -1$

$x \in [3, \infty)$

(a)  $f'(x) = \frac{1}{2}(x^2 - 2x - 3)^{-\frac{1}{2}}(2x - 2)$

$= \frac{x-1}{\sqrt{(x-3)(x+1)}}$

cp's:  $x = \pm 1, 3$



$f(3) = 0$  is local min

(b)  $f(3) = 0$  is absolute min



Max of 1 @  $x = \frac{\pi}{4}$   
 Min of -1 @  $x = \frac{3\pi}{4}$

201 §4.3 #56a

(56)  $f(x) = -2x + \tan x$ ,  $x \in (-\frac{\pi}{2}, \frac{\pi}{2})$

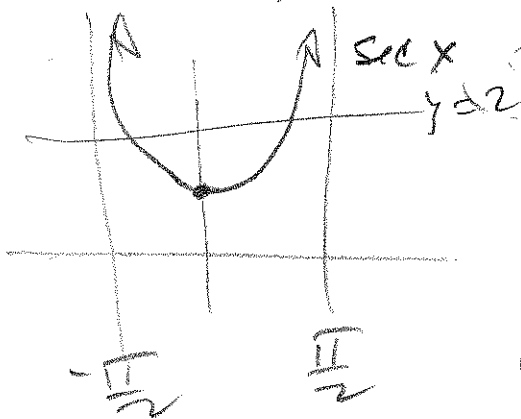
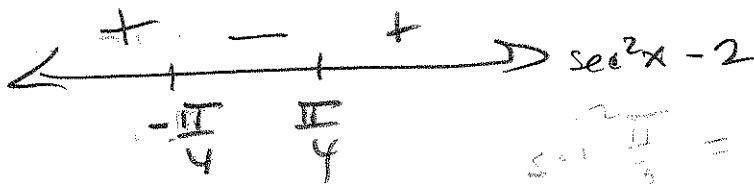
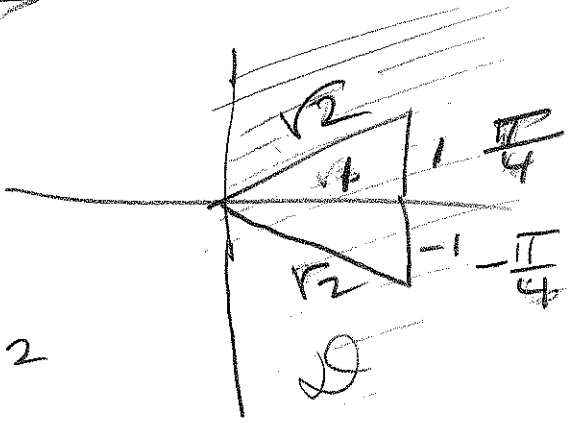
(a)  $f'(x) = -2 + \sec^2 x \stackrel{\text{SET}}{=} 0 \rightarrow$

$\sec^2 x = 2 \rightarrow$

$\sec x = \pm\sqrt{2} \rightarrow$

$\frac{1}{\cos x} = \pm\sqrt{2} \Rightarrow$

$\cos x = \pm \frac{1}{\sqrt{2}}$



$\tan(-\frac{\pi}{4}) - 2(-\frac{\pi}{4})$

$= -1 + \frac{\pi}{2} = \frac{\pi}{2} - 1$

(A) Max of  $\frac{\pi}{2} - 1$  @  $x = -\frac{\pi}{4}$

$\tan(\frac{\pi}{4}) - 2(\frac{\pi}{4})$

$= 1 - \frac{\pi}{2}$

(B) Min of  $1 - \frac{\pi}{2}$  @  $x = \frac{\pi}{4}$

