201 E3

1) a) $f'(x) = 12x^3 + 12x^2 - 60x + 36$

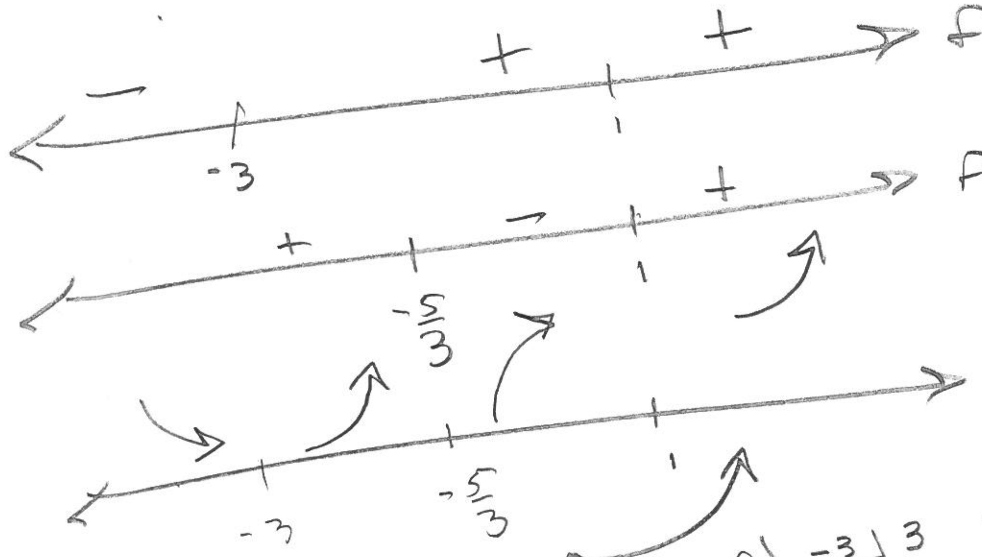
$= 12(x^3 + x^2 - 5x + 3)$

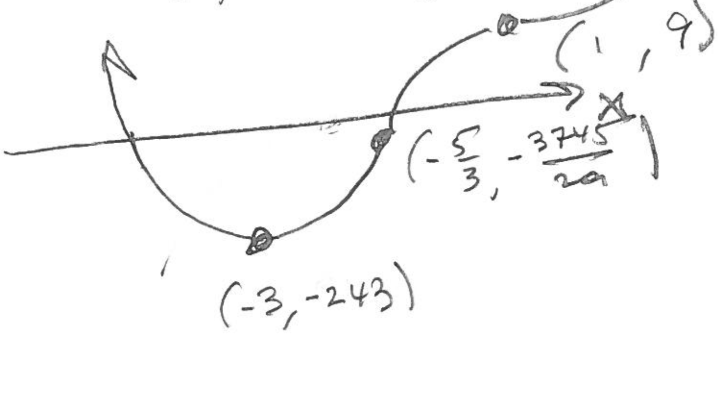
1 |	1	1	-5	3
		1	2	-3
	1	2	-3	0
1 |	1	2	-3	
		1	3	
	1	3	0	

$12(x-1)^2(x+3) = f'(x)$

$f''(x) = 36x^2 + 24x - 60 = 12(3x^2 + 2x - 5)$

$= 12(3x+5)(x-1)$





-3 |	3	4	-30	36	0
		-9	15	45	-243
	3	-5	-15	81	

201 E3

1 a cntd

$$\begin{array}{r|rrrrr} -\frac{5}{3} & 3 & 4 & -30 & 36 & 0 \\ & & -5 & \frac{5}{3} & \frac{425}{9} & -\frac{3745}{27} \\ \hline & 3 & -1 & -\frac{85}{3} & \frac{749}{9} & \end{array}$$

$$\begin{array}{r|rrrrr} 1 & 3 & 4 & -30 & 36 & 0 \\ & & 3 & 7 & -27 & 9 \\ \hline & 3 & 7 & -27 & 9 & 9 \end{array}$$

$f(1)=9$

$f(-3)=-243$

b

$$\begin{array}{r|rrrrr} -4 & 3 & 4 & -30 & 36 & 0 \\ & & -12 & 32 & -8 & -112 \\ \hline & 3 & -8 & 2 & 28 & -112 \end{array}$$

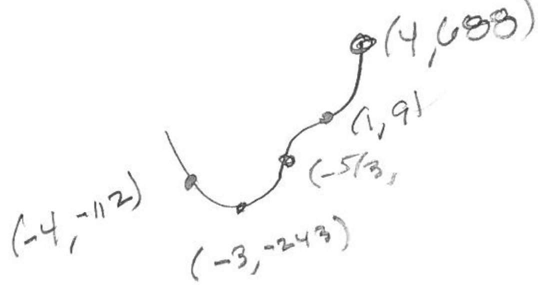
$\boxed{f(-4)=-112}$

$$\begin{array}{r|rrrrr} 4 & 3 & 4 & -30 & 36 & 0 \\ & & 12 & 64 & 136 & 688 \\ \hline & 3 & 16 & 34 & 172 & \end{array}$$

$\boxed{688 = f(4)}$

$\boxed{\text{MAX } 688 \text{ @ } x=4}$

$\boxed{\text{MIN } -243 \text{ @ } x=-3}$



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(10) f is polynomial so cnt^s on [-4,4] &
difbl on (-4,4).

$$\frac{f(4)-f(-4)}{4-(-4)} = \frac{680-(-112)}{8} = \frac{792}{8} = 99$$

$$12x^3+12x^2-60x+36 = 99$$

$$12x^3+12x^2-60x-63 = 0$$

$$4x^3+4x^2-20x-21 = 0$$

Poorly posed

See next pg.

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#1c

$\to$ Now #2

MVT for $f(x) = x^3 - 2x^2 + 5x - 1$ on $[-2, 2]$

$f(2)$:

$$\begin{array}{r|rrrr} 2 & 1 & -2 & 5 & -1 \\ & & 2 & 0 & 10 \\ \hline & 1 & 0 & 5 & 9 \end{array}$$

$$\begin{array}{r|rrrr} -2 & 1 & -2 & 5 & -1 \\ & & -2 & 8 & -26 \\ \hline & 1 & -4 & 13 & -27 \end{array}$$

$$\frac{f(2) - f(-2)}{2 - (-2)} = \frac{9 + 27}{4} = \frac{36}{4} = 9$$

$$f'(x) = 3x^2 - 4x + 5 \overset{\text{SET}}{=} 9$$

$$\Rightarrow 3x^2 - 4x - 4 = 0$$

$$b^2 - 4ac = 16 - 4(3)(-4) = 16 + 48 = 64$$

$$x = \frac{4 \pm 8}{6} \nearrow \frac{12}{6} = 2$$

$$\searrow -\frac{4}{6} = \boxed{-\frac{2}{3} = c \in (-2, 2)}$$

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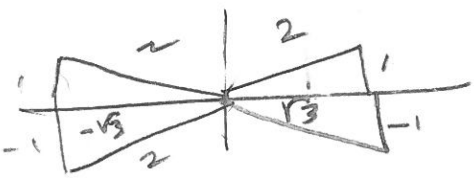
(2)

$g(x) = 3\tan x - 4x$ on $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

$\to g'(x) = 3\sec^2 x - 4 \overset{\text{set}}{=} 0 \to$

$\sec^2 x = \frac{4}{3}$

$\sec x = \pm \frac{2}{\sqrt{3}}$



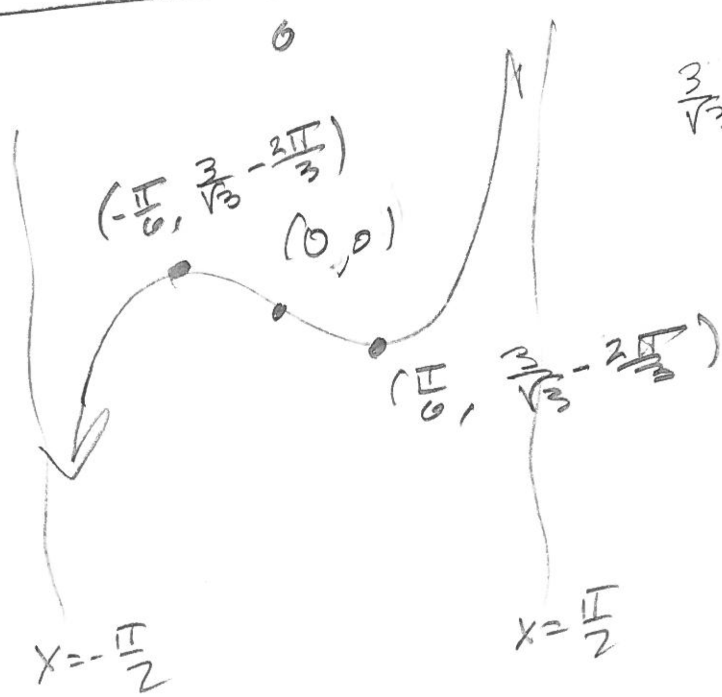
$\to x = \pm \frac{\pi}{6}$

$g''(x) = (2\sec x)(\sec x \tan x) \overset{\text{set}}{=} 0$

$2\sec^2 x = 0$ OR $\tan x = 0$

$x = 0$

$\frac{3}{\sqrt{3}} - 4\cdot\frac{\pi}{6} = \frac{3}{\sqrt{3}} - \frac{2\pi}{3}$



~~3~~ 201 E3

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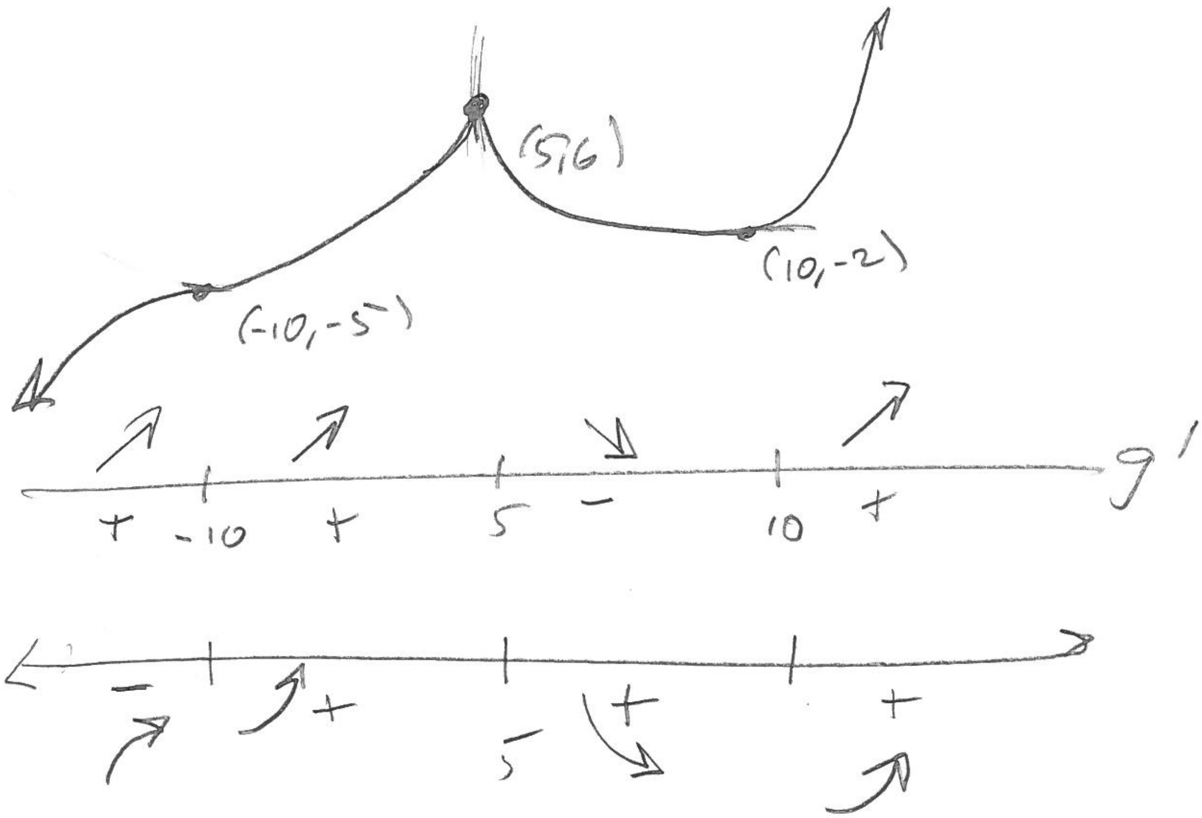

4

(a)

$$\left(\frac{\sqrt{16x^2-5x+11}-4x}{1}\right)\left(\frac{\sqrt{16x^2-5x+11}+4x}{\sqrt{16x^2-5x+11}+4x}\right)$$

$$= \frac{16x^2-5x+11-16x^2}{\sqrt{16x^2-5x+11}+4x} = \frac{x\left(-5+\frac{11}{x}\right)}{x\left(\sqrt{16-\frac{5}{x}+\frac{11}{x^2}}+4\right)}$$

$$\underrightarrow{x \to \infty} \quad \frac{-5}{4+4} = \boxed{\frac{-5}{8}}$$

(b) $\boxed{\infty}$

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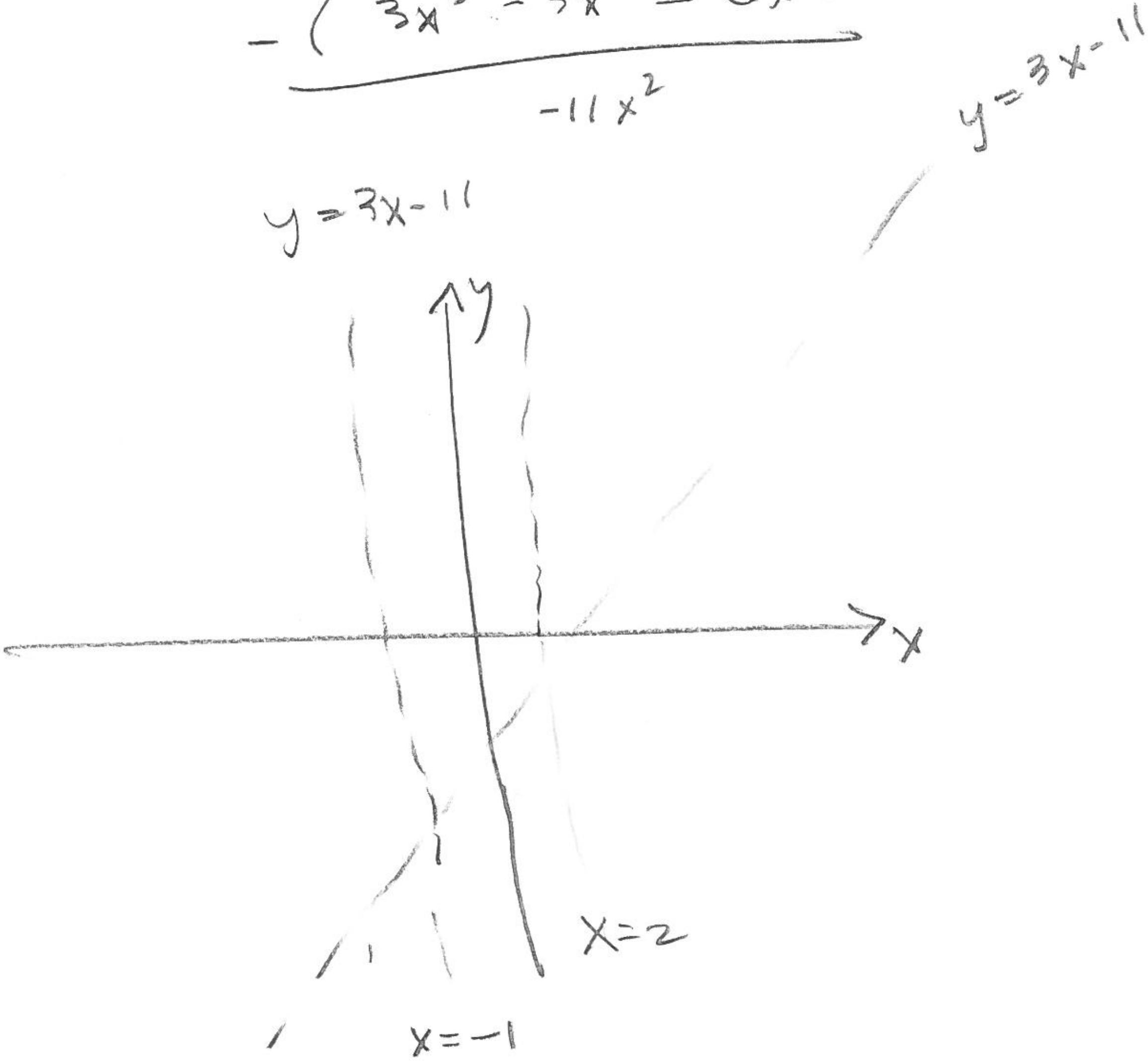
5 $x^2 - x - 2 = (x-2)(x+1)$

VA : $x = -1,\ x = 2$

$$
\begin{array}{r}
3x - 11 \\
x^2 - x - 2 \overline{\big) \, 3x^3 - 14x^2 + 23x - 10} \\
-\left(3x^3 - 3x^2 - 6x\right) \\
\hline
-11x^2
\end{array}
$$



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16) $d = |x^2 - 2x - 8 - (2x^2 - 3x + 15)|$

$= |x^2 - 2x - 8 - 2x^2 + 3x - 15|$

$= |-x^2 + x - 23| = |x^2 - x + 23|$

$b^2 - 4ac = 1 - 4(1)(23) = -91$ No real roots

$= x^2 - x + 23 \longrightarrow$

$d' = 2x - 1 \overset{\text{SET}}{=} 0 \longrightarrow 2x = 1 \longrightarrow x = \frac{1}{2}$

$d(\frac{1}{2}) = (\frac{1}{2})^2 - (\frac{1}{2}) + 23$

$= \frac{1 - 2 + 92}{4} = \boxed{\frac{91}{4} = d}$ @ $x = \frac{1}{2}$

201 E3

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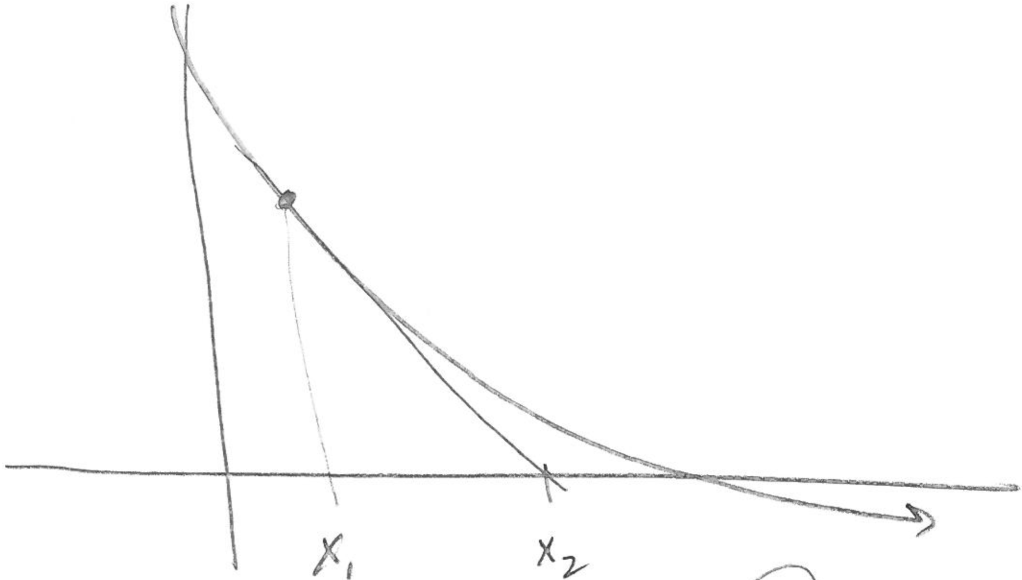

$x_2 =$ where tangent line @ $x=1$ intersects the x-axis.

$$y = f'(x_1)(x - x_1) + f(x_1) \overset{SET}{=} 0$$

$$f'(x_1)x - f'(x_1)x_1 + f(x_1) = 0$$

$$f'(x_1)x = f'(x_1)x_1 - f(x_1)$$

$$x = x_1 - \frac{f(x_1)}{f'(x_1)}$$

$$x_n = x_{n-1} - \frac{f(x_{n-1})}{f'(x_{n-1})}$$

201 E3

B1

$$\begin{array}{r|rrrr} \frac{2}{3} & 3 & -14 & 23 & -10 \\ & & 2 & -8 & 10 \\ \hline & 3 & -12 & 15 & \end{array}$$

$3x^2 - 12x$