2. a) $C(51) - C(50)$

$= 19784.9 - 19600$

$= \$184.90$

b) $C'(x) = 195 - 0.2x$

$C'(50) = \$185.00$

3. a) $p = 900 - \frac{1}{40}x$

b) $C'(x) = 275$

c) $R(x) = xp = 900x - \frac{1}{40}x^2$

d) $R'(x) = 900 - \frac{1}{20}x$

e) $R'(2000) = 800$

$R'(3000) = 750$

f) $P(x) = R(x) - C(x)$

$= -\frac{1}{40}x^2 + 625x - 8400$

g) $P'(x) = -\frac{1}{20}x + 625$

h) $P''(x) = -\frac{1}{20} < 0$ concave down

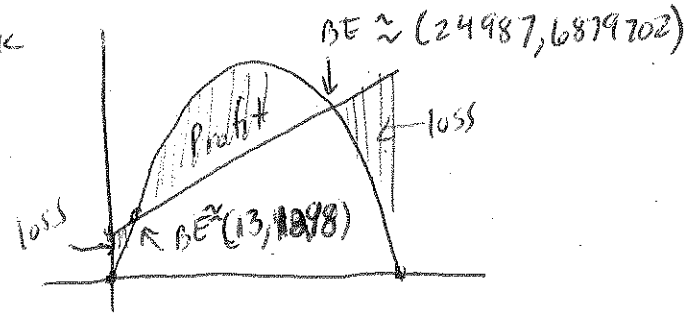
$P'(x) = 0 = -\frac{1}{20}x + 625$

$x = 12{,}500$ guitars

i) $P(12500) = \$3{,}897{,}850$

j) $p = 900 - \frac{1}{40}(12500) = \$587.50$

k



4. a) $\frac{3x^2+3}{\sqrt{x^2+3x}} + 10x^{-6}$

b) $8(4-5t^3)^3(-15t^2) = -120t^2(4-5t^3)^3$

5. a) $6x - \frac{5}{2\sqrt{x}} + x^{-3/2} \Rightarrow \boxed{6 + \frac{5}{4x^{3/2}} - \frac{3}{2x^{5/2}}}$

b) $\frac{(5x+3)4 - (4x-2)5}{(5x+3)^2} = \frac{22}{(5x+3)^2} \Rightarrow y'' = -44(5x+3)^{-3}5$

$= \boxed{\frac{-220}{(5x+3)^3}}$

4 a) $C'(x) = 2$

b) $\bar{C}(x) = \frac{9000+2x}{x}$

c) $\bar{C}'(x) = \frac{-9000}{x^2}$

d) $\bar{C}'(1000) = -0.009$

e) If they are making 1000 umbrellas, the ave cost will decrease by that amount if they make 1 more.

f) HA $\Rightarrow y = 2$

Average cost goes to \$2/umb

5. a) $\frac{(3-7x)(6x)(x^2+3)^2 + 7(x^2+3)^3}{(3-7x)^2}$

b) $(x^2-5)^5 3(2x^3-5)^2(6x^2) + (2x^3-5)^3 5(x^2-5)^4(2x)$

6. $\frac{3x^2+5x-2}{x^2-4} = \frac{(3x-1)(x+2)}{(x-2)(x+2)}$ VA: $x = 2$ HA: $y = 3$

7. a) $\mathbb{R}$

b) $f'(x) = 24x^2 - 8x^3 = 8x^2(3-x)$

c) inc: $(-\infty,0)\cup(0,3)$ dec: $(3,\infty)$

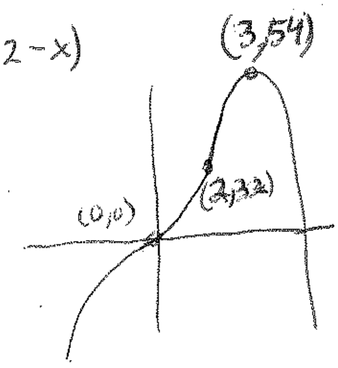
d) max at $x=3$ is 54.

e) $f''(x) = 48x - 24x^2 = 24x(2-x)$

f) con down: $(-\infty,0)\cup(2,\infty)$

con up: $(0,2)$

g) inf pts $(0,0)$ and $(2,32)$



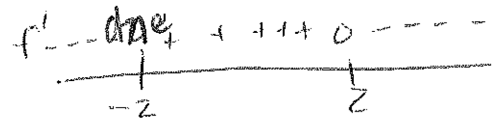
8. $f(x) = \frac{x}{(x+2)^2}$

a) $f'(x) = \frac{(x+2)^2(1) - x[2(x+2)]}{(x+2)^4} = \frac{\cancel{x+2} - 2x}{(x+2)^3} = \frac{2-x}{(x+2)^3}$

b) $f''(x) = \frac{(x+2)^{\cancel{3}}(-1) - (2-x)3\cancel{(x+2)^2}}{(x+2)^{\cancel{6}\,4}} = \frac{-x-2-6+3x}{(x+2)^4} = \frac{2x-8}{(x+2)^4} = \frac{2(x-4)}{(x+2)^4}$

c) $\text{Dom } f = \{x \mid x \neq -2\}$

d)

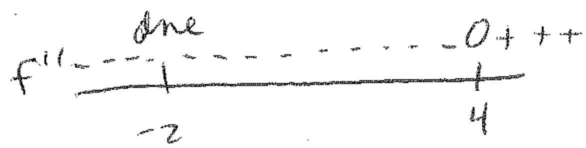


b) $f'(x) = 0 \Rightarrow 2 - x = 0 \Rightarrow x = 2$

$(2, \frac{1}{8})$ is a max

inc: $(-2, 2)$

dec: $(-\infty, -2) \cup (2, \infty)$



c) $f'' = 0 \Rightarrow x = 4$

con down: $(-\infty, -2) \cup (-2, 4)$

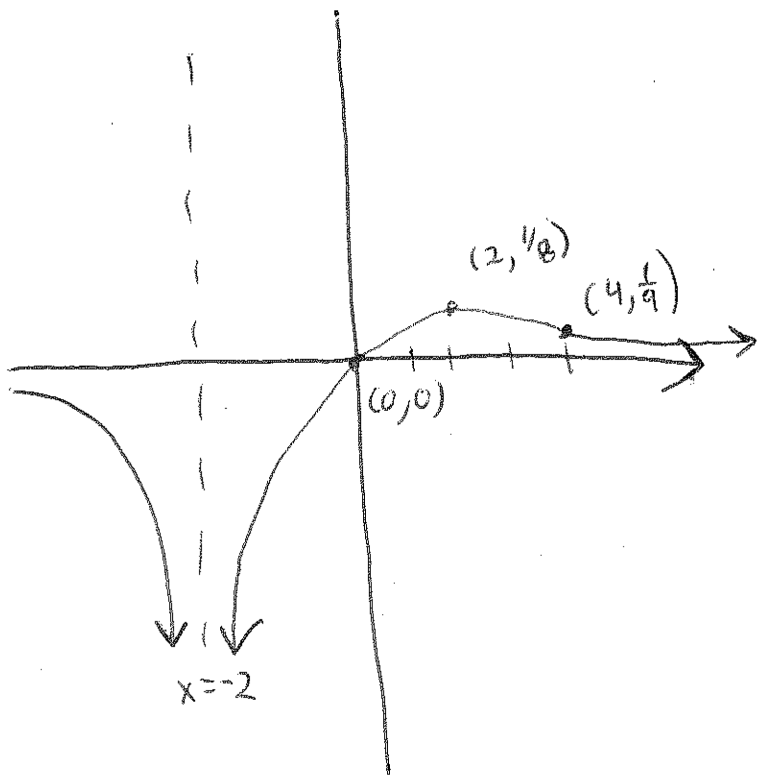
con up: $(4, \infty)$

d) x-int: $(0,0)$

e) y-int: $(0,0)$

f) $y = 0$ is a HA

g) VA: $\cancel{x} = -2$



9. $f(x) = 2x + \frac{5}{x} + \frac{4}{x^3}$

$f'(x) = 2 - \frac{5}{x^2} - \frac{12}{x^4}$

$f'(x) = 0 \Rightarrow$

$0 = 2 - \frac{5}{x^2} - \frac{12}{x^4}$

$0 = 2x^4 - 5x^2 - 12$

$0 = (2x^2 + 3)(x^2 - 4)$

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

but -2 isn't in the domain

$f''(x) = \frac{10}{x^3} + \frac{48}{x^5}$ $\therefore f''(2) > 0$

So the minimum value is $f(2) = 4 + \frac{5}{2} + \frac{4}{8} = \boxed{7}$

10. a) $\frac{\partial z}{\partial x} = 14xy^3 - 6x^2$

b) $f_y = 21x^2y^2 + 3$

c) $f_{xy} = 42xy^2$

11. $R(x) = (\#\text{cars})(\text{price per car})$ $x = \#$ of \$1.50 increases

$= (300 - 6x)(29 + 1.5x)$

$= 8700 + 450x - 174x - 9x^2$

$R(x) = 8700 + 276x - 9x^2$

$R'(x) = 276 - 18x$

$R''(x) = -18$ so R is concave down everywhere

$R'(x) = 0 \Rightarrow$

$276 - 18x = 0$

$18x = 276$

$x = 15.33$

CARS should rent for \$52/day.

Max rev is \$10,816.