Igor Lima Rocha - Prova I

1) a) $\int_0^2 f(x)\,dx = \int_0^2 1+x\,dx = \left(x+\frac{x^2}{2}\right)_0^2 = \left(2+\frac{2^2}{2}\right)-(0) = 4$

b) $\int_0^5 f(x)\,dx = \int_0^2 1+x\,dx + \int_2^3 3\,dx + \int_3^5 7{,}5-1{,}5x\,dx = \left(x+\frac{x^2}{2}\right)_0^2 + (3x)_2^3 + \left(7{,}5x - \frac{1{,}5x^2}{2}\right) = 4+3+3 = 10$

c) $\int_5^7 f(x)\,dx = \left|\int_5^7 7{,}5-1{,}5x\,dx\right| = \left|7{,}5x - \frac{1{,}5x^2}{2}\right|_5^7 = 3$

d) $\int_0^9 f(x)\,dx = \int_0^5 f(x)\,dx + \left|\int_5^9 f(x)\,dx\right| = 10 + 3 + \left|\int_7^9 0{,}5x-6{,}5\,dx\right| = 10+3+\left|\left(\frac{0{,}5x^2}{2}-6{,}5x\right)_7^9\right| = 10+3+\left|\left(\frac{81}{4}-\frac{13}{2}\cdot 9\right)-\left(\frac{49}{4}-\frac{13}{2}\cdot 7\right)\right| = 18$

2) Sendo $T+\text{Sen}(T)$ uma função continua em $[1, \cos(x)]$, a derivada da integral é igual a $x + \text{Sen}(x)$

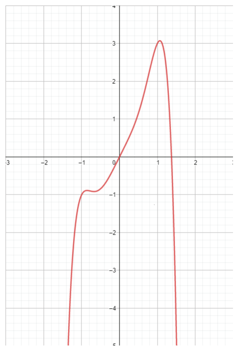
3) $\int_1^2 \frac{4+u^2}{u^3}\,du = 4\int_1^2 \frac{1}{u^3}\,du + \int_1^2 \frac{u^2}{u^3}\,du =$

$4\int_1^2 u^{-3}\,du + \int_1^2 \frac{1}{u}\,du = 4\left(-\frac{1}{2u^2}\right)\Big|_1^2 + (\ln|u|)\Big|_1^2$

$-4\left(\frac{1}{2\cdot4}-\frac{1}{2\cdot1}\right) + (\ln 2 - \ln 1)$

$-4\left(-\frac{3}{8}\right) + \ln 2 = \frac{12}{8} + \ln 2 = \frac{3}{2} + \ln 2$

4)

a) 

b) $x' = 0$

$x'' \cong 1.37$

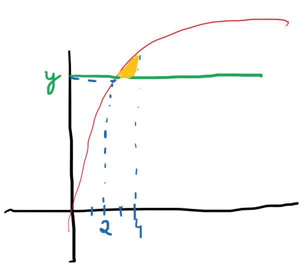
c) $\int_0^{1,37} 2x+3x^4-2x^6\,dx =$

$\left(\frac{\cancel{2}x^2}{\cancel{2}} + \frac{3x^5}{5} - \frac{2x^7}{7}\right)_0^{1,37} =$

$(1{,}37)^2 + \frac{3}{5}(1{,}37)^5 - \frac{2}{7}(1{,}37)^7 =$

$1{,}88 + \frac{3}{5}(4{,}83) - \frac{2}{7}(9{,}06) \cong 2.18$

5) $t = 2 \Rightarrow 5000\left(1-\frac{100}{12^2}\right) = \frac{220000}{144}$



$\int_2^4 5000\left(1-\frac{100}{(t+10)^2}\right) - \frac{220000}{144}\,dt$

$5000\int_2^4 1-\frac{100}{(t+10)^2}\,dt - \left(\frac{220000}{144}t\right)_2^4$

$u = t+10$
$du = dt$

$5000\left[2 - 100\int_2^4 \frac{1}{(t+10)^2}\,dt\right] - \left[\frac{220000\cdot4}{144} - \frac{220000\cdot2}{144}\right]$

$5000\left[2 - 100\int_2^4 u^{-2}\,du\right] - \left(\frac{440000}{144}\right)$

$5000\left[2 - 100\left(-u^{-1}\right)_2^4\right] - \left(\frac{440000}{144}\right)$

$5000\left[2 - 100\left(-\frac{1}{t+10}\right)_2^4\right] - \left(\frac{440000}{144}\right)$

$5000\left[2 - 100\left[\left(-\frac{1}{14}\right)-\left(-\frac{1}{12}\right)\right]\right] - \frac{440000}{144}$

$5000\left[2 - 100\left(\frac{14-12}{168}\right)\right] - \frac{440000}{144}$

$5000\left[2 - \frac{200}{168}\right] - \frac{440000}{144} = 5000\cdot2 - \frac{5000\cdot200}{168} - \frac{5000\cdot88}{144}$

$\frac{5000(48384-28800-14784)}{24192} = \frac{24000000}{24192} \cong 992$