- 53 Uma firma de embalagem necessita fabricar caixas retangulares de $64cm^3$ de volume. Se o material da parte lateral custa a metade do material a ser usado para a tampa e para o fundo da caixa, determinar as dimensões da caixa que minimizam o custo.
  Supondo a caixa com dimensões da base igual a a e b, com altura c.
  Supondo também que o custo da tampa e fundo é igual a x:
  min $2abx + \frac{x}{2}(2bc + 2ac)$
  sujeito a $abc = 64$
  temos
  $$C = 2abx + bcx + acx$$
  Utilizando Lagrange
  $$L = 2abx + bcx + acx - \alpha(abc - 64)$$
  Temos as seguintes derivadas:
  $\frac{\varphi L}{\varphi a} = 2bx + cx - \alpha bc = 0$
  $\frac{\varphi L}{\varphi b} = 2ax + cx - \alpha ac = 0$
  $\frac{\varphi L}{\varphi c} = bx + ax - \alpha ab = 0$
  $\frac{\varphi L}{\varphi \alpha} = 64 - abc = 0$
  Resultado dará $P(a, b, c) = (\sqrt[3]{32}, \sqrt[3]{32}, 2\sqrt[3]{32})$
- 14
  $$\frac{1}{4}.\int_0^4 e^{-x^2}.x.dx$$
  sendo $u = -x^2$, $du = -2x.dx$
  $$\frac{1}{4}.\int_0^4 e^u.\frac{-du}{2}$$
  $$\frac{1}{4}.\frac{-1}{2}.\int_0^4 e^u.du$$
- 21
  $\int\int_R (1 + x + y).dx.dy$
  $= \int_1^2 \int_{-2x+3}^{-3x+5} (1 + x + y).dy.dx$
  $= \int_1^2 [y + xy + \frac{y^2}{2}|_{-2x+3}^{-3x+5}].dx$
  $= \int_1^2 [(-3x+5)+x(-3x+5)+\frac{(-3x+5)^2}{2}-(-2x+3)-x.(-2x+3)-\frac{(-2x+3)^2}{2}].dx$

$\int_1^2[-3x+5-3x^2+5x+\frac{9x^2-30x+25}{2}+2x-3+2x^2-3x-\frac{4x^2-12x+9}{2}].dx$
$\int_1^2[-3x+5x+2x-3x+5-3-3x^2+2x^2+\frac{9x^2-30x+25}{2}-\frac{4x^2-12x+9}{2}].dx$
$\int_1^2[-x^2+x+2+\frac{5x^2-18x+12x+16}{2}].dx$
$\int_1^2[\frac{-2x^2+2x+4+5x^2-18x+12x+16}{2}].dx$
$\int_1^2[\frac{3x^2-16x+20}{2}].dx$
$\frac{1}{2}.\int_1^2(3x^2-16x+20).dx$
$\frac{1}{2}[\frac{3x^3}{3}-\frac{16x^2}{2}+20x]|_1^2$
$=\frac{1}{2}[(\frac{3.8}{3}-\frac{16.4}{2}+20.2)-(\frac{3.1}{3}-\frac{16.1}{2}+20.1)]$
$=\frac{1}{2}.[8-32+40-1+8-20]=\frac{3}{2}$

- 21 (Errei e vou refazer)
  $\int\int_R(1+x+y).dx.dy$
  $=\int_1^2\int_{-2x+3}^{-3x+5}(1+x+y).dy.dx$
  $=\int_1^2[y+xy+\frac{y^2}{2}]|_{-2x+3}^{-3x+5}.dx$
  $=\int_1^2[(-3x+5)+x(-3x+5)+(\frac{9x^2-15x+25}{2})-(-2x+3)-x.(-2x+3)-$
  $(\frac{4x^2-12x+9}{2})].dx$
  $\int_1^2[-3x+5+2x-3+x(-3x+2x+5-3)+\frac{9x^2-4x^2-15x+12x+25-9}{2}].dx$
  $\int_1^2[2-x^2+x+\frac{5x^2-3x+16}{2}].dx$
  $=\int_1^2\frac{3x^2-x+20}{2}.dx=\frac{1}{2}\int_1^2(3x^2-x+20).dx$
  $\frac{1}{2}[\frac{3x^3}{3}-\frac{x^2}{2}+20x]|_1^2$
  $=\frac{1}{2}[8-1-\frac{4-1}{2}+40-20]=\frac{1}{2}.\frac{14-3+40}{2}=\frac{51}{4}$ serasetacerto