Gabarito da 5ª Lista de MAT 140 - Cálculo I   2019/II
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1. O trânsito é mais rápido às 14 horas e é mais lento às 17 horas.

2. O percurso mais econômico é estender o fio $1800\,m$ por terra e o restante por água.

3. O maior rendimento é de $R\$\,125.000,00$.

4. $\left(-\sqrt{\dfrac{3}{2}},\dfrac{3}{2}\right)$ e $\left(\sqrt{\dfrac{3}{2}},\dfrac{3}{2}\right)$ são os pontos sobre a curva $y=x^2$ mais próximos do ponto $P=(0,2)$.

5. O retângulo de maior área que pode ser inscrito no círculo de raio 3 é o quadrado de lado $3\sqrt{2}$.

6. Os quadrados a serem recortados devem ter $2cm$ de lado para que o volume da caixa seja o maior possível.

7. **Correção no enunciado:** volume fixo

   A quantidade de material utilizada na fabricação da lata será mínima quando a razão entre a altura e o raio da base for 2.

8. (a) $2x^{7/2}+4x+c$

   (b) $-\dfrac{2}{3}\,x^{-3}+\dfrac{1}{4}\,x^{-4}+c$

   (c) $-\dfrac{1}{4}\,x^4+ln\,|x|+c$

   (d) $\dfrac{2}{27}\,x^{\frac{9}{4}}-\dfrac{2}{13}\,x^{\frac{13}{12}}+c$

9. (a) $-\dfrac{1}{2}\,cos\,(2x)+c$

   (b) $-\dfrac{1}{3}\,cotg\,(3x-1)+c$

   (c) $\dfrac{1}{2}\,ln\,|2x-5|+c$

   (d) $-\dfrac{1}{2}\,ln\,|cos\,(2x)|+c$

   (e) $ln\,|sen\,(e^x)|+c$

   (f) $\dfrac{1}{3}\,(x^2+1)^{\frac{3}{2}}+c$

   (g) $\dfrac{2}{3}\,(x+1)^{\frac{3}{2}}-2\,(x+1)^{\frac{1}{2}}+c$

   (h) $2\sqrt{tg\,x-1}+c$

   (i) $\sqrt{2\,sen\,x+1}+c$

   (j) $2\sqrt{1+sen^2\,x}+c$

   (k) $\dfrac{arcsen^2\,x}{2}+c$

   (l) $\dfrac{arctg^3\,x}{3}+c$

   (m) $ln\,|\,ln\,x\,|+c$

   (n) $-\dfrac{arccos^2\,x}{2}+\sqrt{1-x^2}+c$

10. (a) $x^2\,e^x+c$

    (b) $2x\,(x+1)^{\frac{1}{2}}-\dfrac{4}{3}\,(x+1)^{\frac{3}{2}}+c$

    (c) $x\,arcsen\,x+\sqrt{1-x^2}+c$

    (d) $-2\,x\,cos\,x+2\,sin\,x-cos\,x+c$

    (e) $-x^3\,cos\,x+3x^2\,sen\,x+6x\,cos\,x-6\,sen\,x+c$

(f) $sen\,x\,tg\,x + cos\,x + c$

(g) $-\dfrac{cotg^2\,x}{2} + c$

(h) $x^6\,sen\,(x^3) + 2x^3\,cos\,(x^3) - 2sen\,(x^3) + c$

(i) $\dfrac{1}{2}\,e^x\,sen\,x + \dfrac{1}{2}\,e^x\,cos\,x + c$

(j) $-x\,e^{-x} - e^{-x} + c$

(k) $x\,ln\,x - x + c$

(l) $sen^2\,x + \dfrac{1}{2}\,x\,cos\,(2x) - \dfrac{1}{4}\,sen(2x) + c$

(m) $-cos\,x\,ln\,(cos\,x) + cos(x) + c$

(n) $2\,\sqrt{x}\,sen\,\sqrt{x} + 2\,cos\,\sqrt{x} + c$

11. (a) $-\dfrac{5}{8}\,ln\,|\,x+5\,| + \dfrac{3}{4}\,ln\,|\,x+3\,| - \dfrac{1}{8}\,ln\,|\,x+1\,| + c$

(b) $\dfrac{1}{9}\,ln\,|\,x+2\,| - \dfrac{1}{9}\,ln\,|\,x-1\,| - \dfrac{1}{3x-3} + c$

(c) $-2\,ln\,|\,x\,| + 2\,ln\,|\,x-2\,| + \dfrac{3}{x-2} + c$

(d) $\dfrac{7}{16}\,ln\,|\,2x+1\,| + \dfrac{9}{16}\,ln\,|\,2x-1\,| - ln\,|\,x\,| + \dfrac{x}{4} + c$

(e) $\dfrac{3}{2}\,ln\,(x^2 - 2x + 5) + \dfrac{1}{2}\,arctg\left(\dfrac{x-1}{2}\right) - ln\,|\,x-1\,| + c$

(f) $ln\,(x^2 + 4) - \dfrac{1}{2}\,ln\,(x^2 + 2) - \dfrac{3}{\sqrt{2}}\,arctg\left(\dfrac{x}{\sqrt{2}}\right) + \dfrac{3}{2}\,arctg\left(\dfrac{x}{2}\right) + c$

(g) $ln\,(x^2 + 4) - 2\,ln\,|\,x+1\,| + \dfrac{1}{2}\,arctg\left(\dfrac{x}{2}\right) + c$

(h) $\dfrac{1}{2}\,ln\,(x^2 + 4) - 2\,ln\,|\,x+2\,| - arctg\left(\dfrac{x}{2}\right) + c$

(i) $\dfrac{1}{2}\,ln\,(x^2 + 1) + arctg(x) - ln\,|\,x-1\,| - \dfrac{1}{x-1} + c$

(j) $3\,ln\,|\,x\,| - \dfrac{17}{3}\,ln\,|\,x-1\,| + \dfrac{83}{3}\,ln\,|\,x-4\,| - x + c$

12. (a) $sen\,x - \dfrac{1}{3}sen^3\,x + c$

(b) $-\dfrac{1}{5}\,cos^5\,x + \dfrac{2}{3}\,cos^3\,x - cos\,x + c$

(c) $\dfrac{1}{7}\,cos^7\,x - \dfrac{1}{5}\,cos^5\,x + c$

(d) $\dfrac{1}{2}\,x - \dfrac{1}{4}\,sen\,(2x) + c$

(e) $\dfrac{1}{1024}\,sen\,(8x) - \dfrac{1}{128}\,sen\,(4x) + \dfrac{3}{128}\,x + c$

(f) $-\dfrac{1}{10}\,cos\,(5x) - \dfrac{1}{2}\,cos\,x + c$

(g) $\dfrac{1}{2}\,ln\,|\,sen^2\,x - 1\,| - \dfrac{1}{2\,sen^2\,x - 2} + c$

(h) $-\dfrac{1}{4}\,ln\,|\,sen\,x + 1\,| + \dfrac{1}{4}\,ln\,|\,sen\,x - 1\,| - \dfrac{sen\,x}{2\,sen^2\,x - 2} + c$

13.

(a) $-arcsen\left(\dfrac{x}{a}\right) - \dfrac{\sqrt{a^2 - x^2}}{x} + c$

(b) $2\,arcsen\left(\dfrac{a}{x}\right) + \sqrt{x^2 - a^2} + c$

(c) $-\dfrac{3}{2}\,ln\,(4\,\sqrt{4 - x^2} + 8) - \dfrac{3}{2}\,ln\,|\,x\,| + c$

(d) $\dfrac{1}{\sqrt{5}}\,ln\,|\,\sqrt{5 - x^2} - \sqrt{5}\,| - \dfrac{1}{\sqrt{5}}\,ln\,|\,x\,| + c$

(e) $\dfrac{\sqrt{x^2 - 36}}{54\,x} + c$

(f) $5\,\sqrt{x^2 - 25} + c$

(g) $\dfrac{1}{42}\,ln\,|\,3x - 7\,| - \dfrac{1}{42}\,ln\,|\,3x + 7\,| + c$

(h) $-\dfrac{x}{4\,\sqrt{4x^2 - 4}} + c$

14. (a) $F(x) = -\dfrac{1}{2}\,cos(x^2) + \dfrac{3}{2}$

(b) $F(x) = \dfrac{1}{9}\,arctg\left(\dfrac{x^3}{3}\right) + \dfrac{2\pi}{9}$

(c) $F(x) = \dfrac{1}{2}\,x^2\,sen\,(x^2) + \dfrac{1}{2}\,cos\,(x^2) + 1$

15. (a) $f(x) = ln\,\sqrt{\dfrac{x - 2}{x + 2}} - 2$

(b) $f(x) = 7\,ln\,|\,x^2 + \sqrt{x^4 - 9}\,| + ln\,3$

16. $f(x) = x^3 + 3x + 2$

17. $f(x) = -ln\,|\,cos\,x\,| - \dfrac{x^2}{2} + 1$

18. (a) $\dfrac{8}{3}$

(b) 0

(c) $\dfrac{\pi}{4}$

(d) $\dfrac{1}{2}\,(e\,cos\,1 + e\,sen\,1 - 1)$

(e) $\dfrac{2}{15}$

(f) $-\dfrac{1}{2}\,ln\,10 + ln\,3 + \dfrac{1}{2}\,ln\,2$

(g) 0

(h) $ln\,2$

(i) 1

(j) $ln\left(\dfrac{2 - \sqrt{2}}{2}\right) + ln\left(\dfrac{2 + \sqrt{2}}{2}\right)$

(k) $\dfrac{\pi}{4}$

(l) $-ln\,2$

(m) $\dfrac{5}{2}$

(n) $\dfrac{5}{2}$

(o) $\dfrac{49}{6}$

(p) $\dfrac{17}{2}$

19. (a) $2\,ln\,2 - 1$

(b) $\dfrac{46}{3}$

(c) $\dfrac{15}{2} - 8\,ln\,2$

(d) $\dfrac{3}{ln\,2} - \dfrac{4}{3}$

(e) $-\dfrac{3}{4} + 2\,ln\,2$

(f) $\dfrac{71}{6}$

(g) $\dfrac{37}{12}$

(h) $9\,ln\,3$

20. (a) $\displaystyle\int_0^{\frac{5}{2}} x\,dx + \int_{\frac{5}{2}}^5 (-x + 5)\,dx = \dfrac{25}{2}$

$\displaystyle\int_0^{\frac{5}{2}} [(5 - y) - y]\,dy = \dfrac{25}{2}$

(b) $\int_0^1 \left(2x - \frac{1}{2}x\right) dx + \int_1^2 \left(3 - x - \frac{1}{2}x\right) dx = \frac{3}{2}$

$\int_0^1 \left(2y - \frac{1}{2}y\right) dy + \int_1^2 \left(3 - y - \frac{1}{2}y\right) dy = \frac{3}{2}$

(c) $\int_0^5 (x^2 + 1 - x + 2) \, dx = \frac{265}{6}$

$\int_{-2}^1 (y + 2) \, dy + \int_1^3 (y + 2 - \sqrt{y-1}) \, dy + \int_3^{26} (5 - \sqrt{y-1}) \, dy = \frac{625}{6}$