1a) $D(f) = x \in \mathbb{R} \mid x \neq \{2\}$

$$(x-2)^2 \neq 0 \Rightarrow x - 2 \neq \sqrt{0} \Rightarrow \underline{x \neq 2}$$

1b) $f(0) = \dfrac{16 - 0^2}{(0-2)^2} = \dfrac{16}{4} = \underline{4}$

$$\frac{16 - x^2}{(x-2)^2} = 0 \Rightarrow 16 - x^2 = 0 \Rightarrow -x^2 = -16 \Rightarrow x = \pm\sqrt{16}$$

$$\underline{x = \pm 4}$$

1c) $f'(x) = \dfrac{-2x \cdot (x-2)^2 - (16-x^2) \cdot 2(x-2) \cdot 1}{(x-2)^4} =$

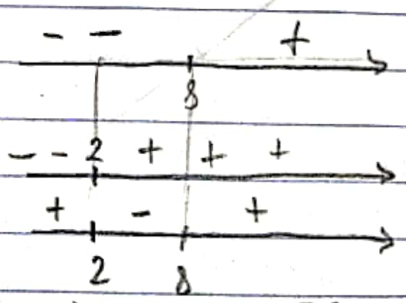
$$= \frac{\cancel{(x-2)} \cdot (-2x(x-2) - (32 - 2x^3))}{(x-2)^{\cancel{4}}} = \frac{\cancel{-2x^2} + 4x - 32 + \cancel{2x^2}}{(x-2)^3}$$

$$\frac{4x - 32}{(x-2)^3} \Rightarrow \frac{4x-32}{(x-2)^3} = 0 \Rightarrow 4x = 32 \Rightarrow \underline{x = 8}$$

$$(x-2)^3 = 0 \Rightarrow \underline{x = 2}$$

Pontos críticos: $x = 8$. O $x = 2$ não pertence ao $D(f)$.

1d) $f'(x) = \dfrac{4x - 32}{(x-2)^3} =$



f é crescente em $(-\infty, 2)$ e em $[8, +\infty)$

f é decrescente em $(2, 8]$

1e) f não é contínua em $x=2$

$$f(8) = \frac{16-(8)^2}{(8-2)^2} = \frac{-48 :6}{36 :6} = -\frac{8}{6} \quad \text{coordenadas } \left(8, -\frac{4}{3}\right)$$

Em $x=8$ temos um mínimo local

1f) $$f'(x) = \frac{4x-32}{(x-2)^3} \Rightarrow f''(x) = \frac{4\cdot(x-2)^3-(4x-32)\cdot 3\cdot(x-2)^2}{(x-2)^6}$$

$$\frac{\cancel{(x-2)^2}\cdot(4\cdot(x-2)^1-3\cdot(4x-32))}{(x-2)^{\cancel{6}}} = \frac{(\overbrace{4x-8-12x}^{-8x}+\overbrace{96}^{88})}{(x-2)^4}$$

$$\frac{-8x+88}{(x-2)^4} = 0 \Rightarrow -8x=-88 \Rightarrow x = \frac{88}{8} \Rightarrow x = 11$$

$$(x-2)^4 = 0 \Rightarrow x=2$$

		2		11	
$-8x+88$	+				−
$(x-2)^4$	+	2	+	+	+
	+		+		−

concavidade voltada para cima em $(-\infty, 2)$ e $(2, 11]$

concavidade voltada para baixo em $[11, +\infty)$

1g) $$\lim_{x\to 2^+} \frac{16-x^2}{(x-2)^2} = \frac{16-(2)^2}{(2-2)^2} = \frac{12}{0^+} \quad +\infty$$

Possui uma assíntota vertical em $x=2$

$$\lim_{x\to+\infty} \frac{16-x^2}{(x-2)^2} = \frac{16-\infty}{+\infty} = \frac{-\infty}{+\infty} = \text{indeterminação}$$

data

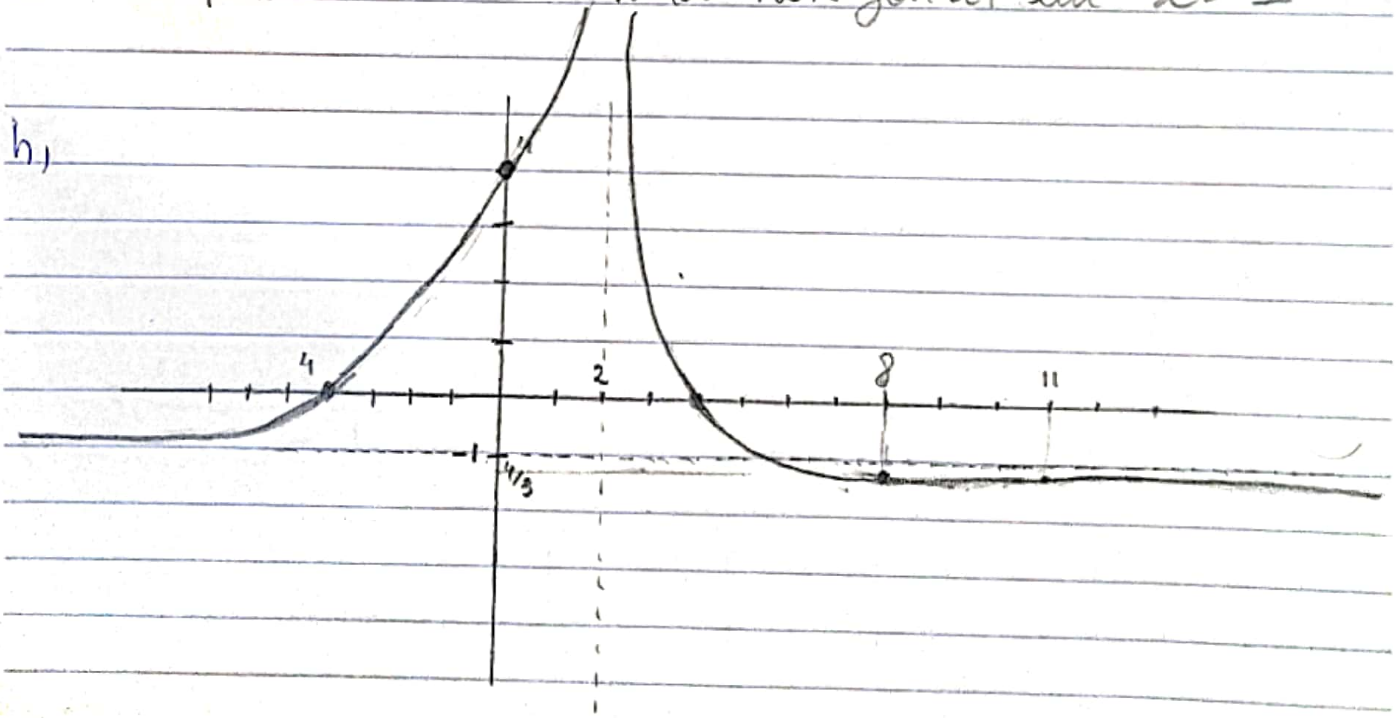
1g $$\frac{\lim_{x\to+\infty} -2x}{\lim_{x\to+\infty} 2(x-2)} = \frac{-\infty}{+\infty} \Rightarrow \lim_{x\to+\infty} \frac{-2}{2} = -1$$

$$\lim_{x\to-\infty} \frac{16-x^2}{(x-2)^2} = \frac{16-\infty}{+\infty} = \frac{-\infty}{+\infty}$$

$$\frac{\lim_{x\to-\infty} -2x}{\lim_{x\to-\infty} 2.(x-2)} = \frac{+\infty}{-\infty} \Rightarrow \lim_{x\to-\infty} \frac{-2}{2} = -1$$

Possui uma assintota horizontal em $x = -1$

1h)



$$f(11) = \frac{16-(11)^2}{(11-2)^2} = \frac{-105}{81} = -1{,}29$$

data

2 $\lim_{x\to 1^-} (1-x)^{\ln(x)} \Rightarrow (1-1)^{\ln(1)} = 0^0 =$ indefinido

$\ln \lim_{x\to 1^-} (1-x)^{\ln(x)} = \ln L \Rightarrow \lim_{x\to 1^-} \ln (1-x)^{\ln(x)} = \ln L$

$\lim_{x\to 1^-} \ln(x)\cdot(\ln(1-x)) = \ln L \Rightarrow \lim_{x\to 1^-} \frac{\ln(1-x)}{(\ln(x))^{-1}} = \ln L$

$* \ -1\cdot(\ln(x))^{-2}\cdot\frac{1}{x}$

$\frac{\lim_{x\to 1^-} -\frac{1}{1-x}}{\lim_{x\to 1^-} -\frac{(\ln(x))^{-2}}{x}} = \ln L \Rightarrow -\frac{1}{1-x} \cdot -x(\ln(x))^2 = \frac{x(\ln(x))^2}{1-x}$

$\ln L = \frac{\lim_{x\to 1^-} 1\cdot(\ln(x))^2 + x\cdot 2(\ln(x))\cdot\frac{1}{x}}{\lim_{x\to 1^-} -1} \Rightarrow \frac{\lim_{x\to 1^-} (\ln(x))^2 + 2(\ln(x))}{\lim_{x\to 1^-} -1}$

$\ln L = \frac{(\ln(1))^2 + 2\cdot(\ln(1))}{-1} = \frac{0^2 + 2\cdot 0}{-1} = 0$

$\ln L = 0 \Rightarrow e^0 = L \Rightarrow \underline{L = 1}$

data . .

S T Q Q S S D

3-a $\int e^{x}(x+1)\cos(xe^{x})\,dx$ $\cos(x) = \operatorname{sen}(x) + C$

$u = x \cdot e^{x} \Rightarrow \frac{du}{dx} = 1 \cdot e^{x} + x \cdot e^{x} = e^{x}(1+x) =$

$\int \cos(u)\,du \Rightarrow \operatorname{sen}(u) + C \Rightarrow \operatorname{sen}(xe^{x}) + C$

3,b, $\int \frac{\ln(x)}{x\sqrt{1+(\ln(x))^2}}\,dx$ $u = 1+(\ln(x))^2$

$\frac{du}{dx} = 1 \quad 2\ln(x) \cdot \frac{1}{x} \Rightarrow \frac{2\ln(x)\,dx}{x} = du$

$\frac{\ln(x)\,dx}{x} = \frac{du}{2}$

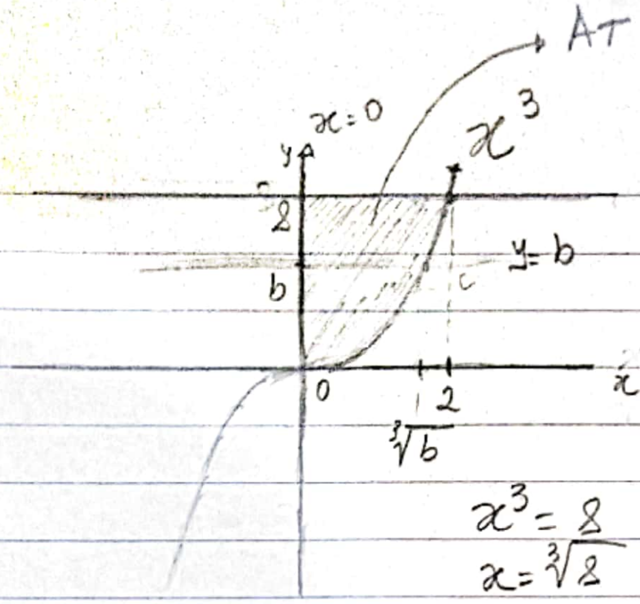
$\int \frac{du}{2} \cdot \frac{1}{\sqrt{u}} =$

$\int \frac{1}{2\sqrt{u}}\,du \Rightarrow \frac{1}{2}\int \frac{1}{\sqrt{u}}\,du \Rightarrow \frac{1}{2} \cdot \frac{1 \cdot u^{-\frac{1}{2}+1}}{-\frac{1}{2}+1} \Rightarrow \frac{1}{2} \cdot \frac{u^{\frac{1}{2}}}{\frac{1}{2}}$

$\frac{1}{2} \cdot \sqrt{u} \cdot \frac{2}{1} = \frac{\cancel{2}\sqrt{u}}{\cancel{2}} = \sqrt{u}$

$\sqrt{1+(\ln(x))^2} + C$

4,



$y=8$
$y=b$
$y=x^3$

$y=b \Rightarrow \underline{y=2\sqrt[4]{32}}$

$x^3=8$
$x=\sqrt[3]{8}$
$\underline{x=2}$

$AT=\int_0^2 (8-(x^3))\,dx = \int_0^2 (8-x^3)\,dx = 8x-\frac{x^{3+1}}{3+1} = 8x-\frac{x^4}{4}.$

$8x-\frac{x^4}{4}\Big|_0^2 = \left(8\cdot 2-\frac{2^4}{4}\right)-\cancel{\left(8\cdot 0-\frac{0^4}{4}\right)} = 16-\frac{16}{4} = \frac{64-16}{4} = 12$

$\underline{AT=12}$

* $x^3=b$
$x=\sqrt[3]{b}$

$\int_0^{\sqrt[3]{b}} (b-(x^3))\,dx = bx-\frac{x^4}{4}$

$\Rightarrow \left(b\cdot(\sqrt[3]{b})-\frac{(\sqrt[3]{b})^4}{4}\right)-\cancel{\left(b\cdot 0-\frac{0^4}{4}\right)} = b\sqrt[3]{b}-\frac{(\sqrt[3]{b})^4}{4} = 12$

$\Rightarrow \frac{4b\sqrt[3]{b}-(\sqrt[3]{b})^4}{4} = 6 \Rightarrow 4b\sqrt[3]{b}-(\sqrt[3]{b})^4 = 24 \Rightarrow$

$\Rightarrow 4b\sqrt[3]{b}-(\sqrt[3]{b})\cdot(\sqrt[3]{b})^3 = 24 \Rightarrow 4b\sqrt[3]{b}-b\sqrt[3]{b} = 24 \Rightarrow$

$3b\sqrt[3]{b} = 24 \Rightarrow b\sqrt[3]{b} = 8 \Rightarrow b\cdot b^{1/3} = 8 \Rightarrow b^{1+\frac{1}{3}} = 8$

$b^{4/3} = 8 \Rightarrow \sqrt[3]{b^4} = 8 \Rightarrow b^4 = 8^3 \Rightarrow b^4 = 512 \Rightarrow$

$b=\sqrt[4]{512} \Rightarrow b=\sqrt[4]{16\cdot 32} = \underline{b=2\sqrt[4]{32}}$