$$\int_1^4 \frac{10\sqrt{x}}{(1+x^{3/2})^2}\,dx$$

(a)

$u = x^{3/2} + 1$ $u(1) = 2$

$du = \frac{3}{2} x^{\frac{1}{2}}\, dx$ $u(4) = 9$

$dx = \frac{du}{\frac{3}{2} x^{\frac{1}{2}}}$

$$= \int_2^9 \frac{10\sqrt{x}}{u^2} \cdot \frac{du}{\frac{3}{2}\sqrt{x}} = \frac{10}{\frac{3}{2}} \int_2^9 u^{-2}\,du$$

$$= \frac{20}{3} \left.\frac{u^{-1}}{-1}\right]_2^9 = -\frac{20}{3}\left[9^{-1} - 2^{-1}\right]$$

$$= -\frac{20}{3}\left[\frac{1}{9} - \frac{1}{2}\right] = \frac{70}{27}$$

$$\int_1^4 \frac{10\sqrt{x}}{(1+x^{3/2})^2}\,dx$$

$u = x^{3/2} + 1$

$du = \frac{3}{2}x^{\frac{1}{2}}\,dx$

b

$$10\int_1^4 \frac{x^{\frac{1}{2}}dx}{(x^{3/2}+1)^2} = \frac{10}{\frac{3}{2}}\int_1^4 \frac{\frac{3}{2}x^{\frac{1}{2}}dx}{(x^{3/2}+1)^2}$$

Scratch: $\frac{20}{3}\int u^{-2}du = \frac{20}{3}\frac{u^{-1}}{-1} + C = -\frac{20}{3}u^{-1} + C$

$= -\frac{20}{3}(x^{3/2}+1)^{-1} + C$

$$= \frac{20}{3}\int_1^4 (x^{3/2}+1)^{-2}\left(\frac{3}{2}x^{\frac{1}{2}}dx\right)$$

$$= \frac{20}{3}\left[\frac{(x^{\frac{3}{2}}+1)^{-1}}{-1}\right]_1^4 = -\frac{20}{3}\left[(4^{\frac{3}{2}}+1)^{-1} - (1^{3/2}+1)^{-1}\right]$$

$$= -\frac{20}{3}\left[(8+1)^{-1} - (2)^{-1}\right] = -\frac{20}{3}\left[\frac{1}{9} - \frac{1}{2}\right]$$

$$= -\frac{20}{3}\left[\frac{2-9}{18}\right] = -\frac{20}{3}\left[\frac{-7}{18}\right]$$

$$= \frac{70}{27} = 2.\overline{592}$$

$$\int \frac{1}{x^3}\sqrt{\frac{x^2-1}{x^2}}\,dx$$

Lookin' for a way to get $u^n du$ or $\sin(u)\,du$

Somehow gonna make a du

$$= \int \frac{1}{x^3}\sqrt{1-\frac{1}{x^2}}\,dx$$

$$u = 1 - x^{-2}$$
$$du = -(-2)x^{-3}dx$$
$$du = 2x^{-3}dx$$
$$\frac{du}{2x^{-3}} = dx$$

$$= \frac{1}{2}\int 2x^{-3}\sqrt{1-x^{-2}}\,dx$$

$$= \int x^{-3}\left(u^{\frac{1}{2}}\right)\frac{du}{2x^{-3}}$$

$$= \frac{1}{2}\int u^{\frac{1}{2}}du = \frac{1}{2}\left[\frac{u^{\frac{3}{2}}}{\frac{3}{2}}\right] + C = \frac{2}{3}\cdot\frac{1}{2}u^{\frac{3}{2}} + C$$

$$= \frac{1}{3}\left(1-x^{-2}\right)^{\frac{3}{2}} + C$$

$$= \frac{1}{3}\left(\frac{x^2-1}{x^2}\right)^{3/2} + C$$

$$= \frac{1}{3}\sqrt{\left(\frac{x^2-1}{x^2}\right)^3} + C$$

$$= \frac{1}{3}\left(\sqrt{\frac{x^2-1}{x^2}}\right)^3 + C$$

It all good

Nov 16-12:38 PM

$$\int \sqrt{\frac{x^4}{x^3-1}}\,dx \qquad u = x^3-1$$
$$du = 3x^2\,dx$$

$$= \int \frac{\sqrt{x^4}}{\sqrt{x^3-1}}\,dx = \int \frac{|x^2|}{\sqrt{x^3-1}}\,dx$$

$x^2 \geq 0 \Rightarrow$
$|x^2| = x^2$

$$= \frac{1}{3}\int (x^3-1)^{-\frac{1}{2}}(3x^2\,dx)$$

$$= \frac{1}{3}\int u^{-\frac{1}{2}}\,du = \frac{1}{3}\,\frac{u^{\frac{1}{2}}}{\frac{1}{2}} + C = \frac{2}{3}(x^3-1)^{\frac{1}{2}} + C$$

$$= \frac{2}{3}\sqrt{x^3-1} + C$$

$f(x) = x^3 - 9x^2 + 9x + 10$

$g(x) = x^2 - 4x + 4$

(i) Graph f & g separately

(ii) Graph f - g

f: 2 or 0 pos.

$f(-x) = -x^3 - 9x^2 - 9x + 10$

1 neg.

$\frac{p}{q}$: ±1, ±2, ±5, ±10

Guess x=2, cuz I R smert.

$$\begin{array}{r|rrrr} 2 & 1 & -9 & 9 & 10 \\ & & 2 & -14 & -10 \\ \hline & 1 & -7 & -5 & 0 \end{array}$$

$f(x) = (x-2)(x^2-7x-5)$

$x^2 - 7x - 5 = 0$

$x^2 - 7x = 5$

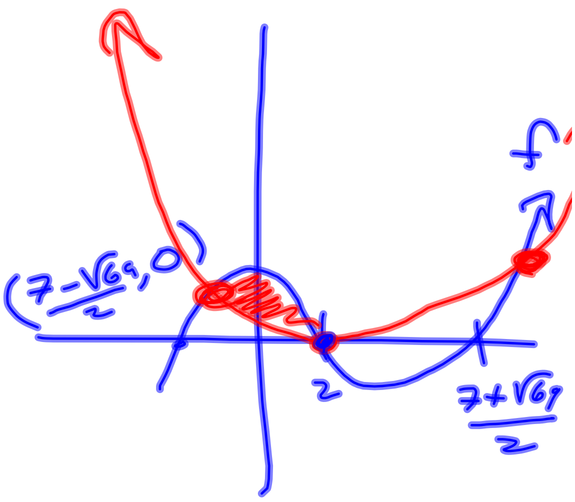
$x^2 - 7x + \left(\frac{7}{2}\right)^2 = 5 + \frac{49}{4}$

$\left(x - \frac{7}{2}\right)^2 = \frac{69}{4}$

$x - \frac{7}{2} = \pm \frac{\sqrt{69}}{2}$

$x = \frac{7 \pm \sqrt{69}}{2}$

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



$x^2-4x+4 = x^3-9x^2+9x+10$

$x^3-10x^2+13x+6=0$

pic sez

$x=2$

$$\begin{array}{r|rrrr} 2 & 1 & -10 & 13 & +6 \\ & & 2 & -16 & -6 \\ \hline & 1 & -8 & -3 & 0 \end{array}$$

$x^2-8x-3=0$

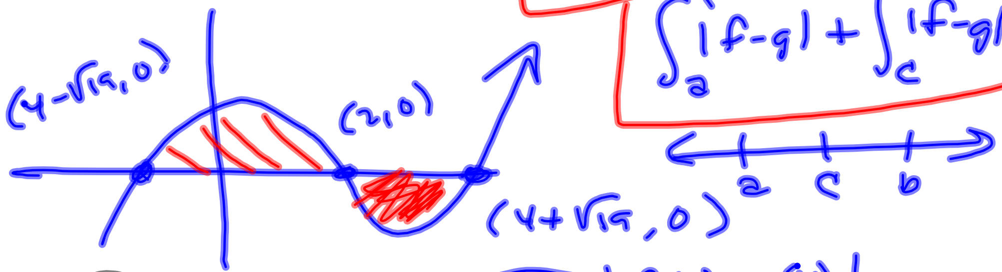
$x^2-8x+4^2 = 3+16$

$(x-4)^2 = 19$

$x = 4 \pm \sqrt{19}$

$$\boxed{\int_a^b |f-g| =}$$

$$\boxed{\int_a^c |f-g| + \int_c^b |f-g|}$$



$|f(x)-g(x)|$

$$\int_{4-\sqrt{19}}^{2} (x^3-10x^2+13x+6)\,dx$$

$$-\int_{2}^{4+\sqrt{19}} (x^3-10x^2+13x+6)\,dx \quad -(\ )$$