Today is Quiz Day Off.

I'll hang around and do some review of algebra concepts with which people struggle.

Completing the square. Graphing quadratics.

Chain Rule

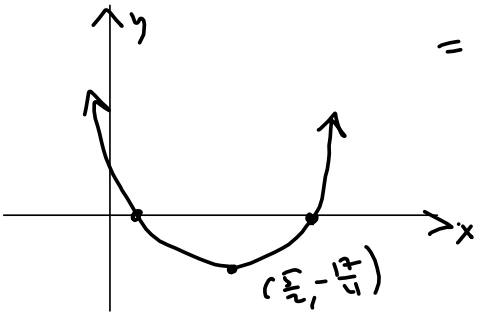
u-Substitution

$f(x) = x^2 - 5x + 2 = x^2 - 5x + \left(\frac{5}{2}\right)^2 - \frac{25}{4} + \frac{2}{1}\cdot\frac{4}{4}$

$= \left(x - \frac{5}{2}\right)^2 - \frac{17}{4} \overset{\text{SET}}{=} 0 \Rightarrow \left(x - \frac{5}{2}\right)^2 = \frac{17}{4}$

$\sqrt{\frac{17}{4}} = \frac{\sqrt{17}}{2}$

$x = \frac{5}{2} \pm \frac{\sqrt{17}}{2}$



Calculus way:

$f'(x) = 2x - 5 \overset{\text{SET}}{=} 0$

$\Rightarrow 2x = 5$

$x = \frac{5}{2}$

$f\left(\frac{5}{2}\right) = \left(\frac{5}{2}\right)^2 - 5\left(\frac{5}{2}\right) + 2$

$= \frac{25}{4} - \frac{25}{2}\cdot\frac{2}{2} + \frac{2}{1}\cdot\frac{4}{4}$

$= \frac{25 - 50 + 8}{4} = -\frac{17}{4}$

Vertex

$(\frac{5}{2}, -\frac{17}{4})$

Quadratic formula way

$f(x) = x^2 - 5x + 2 \overset{\text{SET}}{=} 0$

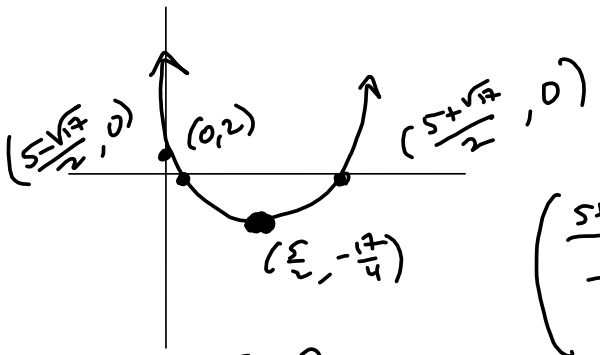
$\Rightarrow b^2 - 4ac = 5^2 - 4(1)(2) = 17$

$\rightsquigarrow \sqrt{17}$

$x = \frac{5 \pm \sqrt{17}}{2}$

$= (-5)^2$

$\neq -5^2$



$\left(\frac{\frac{5+\sqrt{17}}{2} + \frac{5-\sqrt{17}}{2}}{2}\right) = \frac{\frac{10}{2}}{2} = \frac{10}{4} = \frac{5}{2}$

$\frac{5}{2}$ | 1 | -5 | 2

$\frac{5}{2}$ | $-\frac{25}{4}$

1 | $-\frac{5}{2}$ | $-\frac{17}{4}$

x^3 x^2 x^1 c r

$\frac{4}{4}\cdot\frac{2}{1} - \frac{25}{4} = \frac{-17}{4}$

$x - \frac{1}{2}, r = -\frac{17}{4}$

$f\left(\frac{5}{2}\right) = -\frac{17}{4}$, by Remainder Theorem

$(x+1)^2 + (y-5)^2 = 25$

$x^2+2x+1 + y^2-10y+25 = 25$

$x^2+2x+y^2-10y+1 = 0$

$(x^2+2x+1) + (y^2-10y+5^2) = -1+1+25$

$\frac{2}{2}=1 \rightsquigarrow 1^2 \qquad \frac{10}{2}=5 \rightarrow 5^2$

$(x+1)^2 + (y-5)^2 = 25$

$x^2+2x = 0 \Rightarrow$

$x(x+2)=0 \Rightarrow$

$x=0 \quad$ or $\quad x=-2$

$\frac{-2+0}{2} = -1 = h$

$y^2-10y=0$

$y(y-10)=0$

$y=0$ or $y=10$

$\frac{10+0}{2}=5=k$

$(x-h)^2+(y-k)^2=0$

$(x-(-1))^2+(y-k)^2=0$

$(x+1)^2+(y-5)^2$

$x^2+2x \quad + y^2-10y \quad = -1$

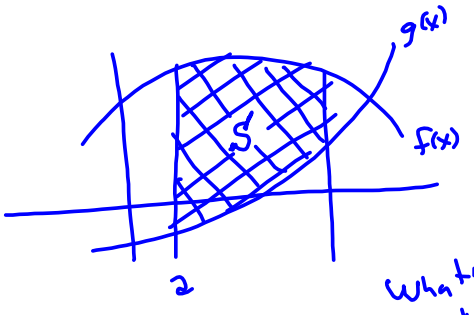
$(x+1)^2 \quad + (y-5)^2 = -1+1+25$

$x^2+2x+1 \quad + y^2-10y+25$

$(x+1)^2+(y-5)^2=25$

Breaking Trail

S 5.1



Area between f & g on $[a,b]$

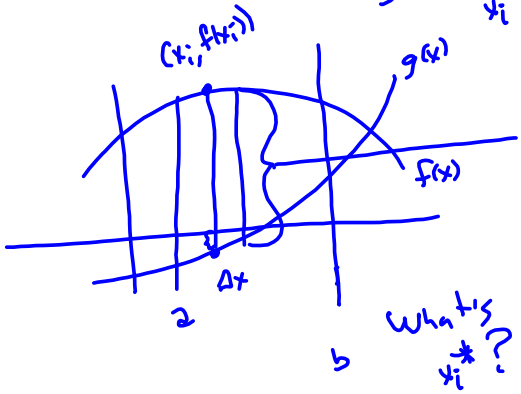
f, g cnts

$f(x) \geq g(x)$ on $[a,b]$

$\sum_{i=1}^{n} \left(f(x_i^*) - g(x_i^*)\right)$

What's x_i^*?

?



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What's x_i^*?

$$A = \lim_{n\to\infty} \sum_{k=1}^{n} \left[f(x_k^*) - g(x_i^*)\right] \Delta x$$

Area is $\int_a^b (f(x) - g(x))\,dx$ (when f, g cnts, $f \geq g$)

Area bounded by $y = f(x)$, $y = g(x)$, $x = a$, and $x = b$.

Area $= \int_a^b |f(x) - g(x)|\,dx$ Area bdd by $f(x), g(x)$, $x = a, x = b$.

In general

f, g cnts

$$f(x) = \begin{cases} x^2-5x-14 & \text{if } x<3 \\ 3x-29 & \text{if } x\geq 3 \end{cases}$$

Suture point
$x=3$

$x^2-5x-14,\ x<3$

$(x-7)(x+2)$

$-56-25=-81$

$\frac{7-2}{2} = \frac{5}{2} = h$

Divide by $x+\frac{5}{2}$

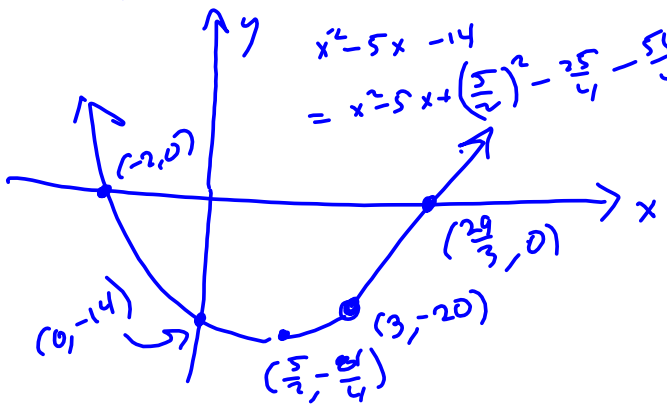
$\frac{5}{2}$ | 1 $\quad -5 \quad -14$

$\quad\quad \frac{5}{2} \quad -\frac{25}{4}$

1 $\quad -\frac{5}{2} \quad -\frac{81}{4} = k$

$\frac{75}{-28}$
$\frac{}{47}$

$(x-\frac{5}{2})^2 - \frac{81}{4}$



$x^2-5x-14$

$= x^2-5x+\left(\frac{5}{2}\right)^2 - \frac{25}{4} - \frac{56}{4} = (x-\frac{5}{2})^2 - \frac{81}{4}$

$\frac{14}{2}=7$

$x = \frac{5\pm 9}{2}$ $\quad -\frac{4}{2}=-2$

$x\geq 3$

$3x-29$

$3x=29$

$x=\frac{29}{3}$

(3,20)

$3(3)-29=-20$

3 | 1 $\quad -5 \quad -14$

$\quad\quad 3 \quad -6$

1 $\quad -2 \quad -20$