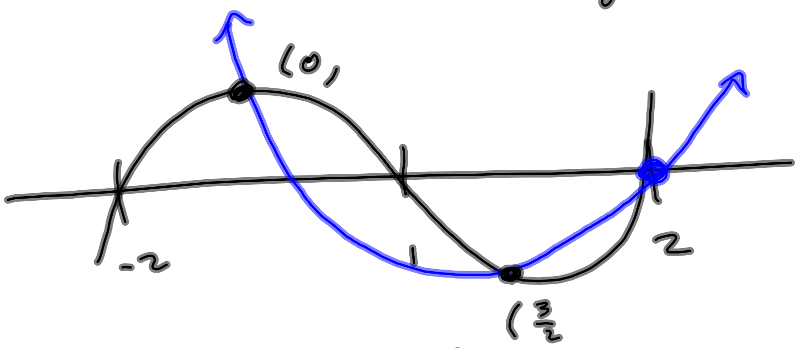
Area between cubic & quadratic.



$f(x) = (x+2)(x-1)(x-2)$

$f(0) = 2(-1)(-2) = 4$

$f\left(\frac{3}{2}\right) = \left(\frac{7}{2}\right)\left(\frac{1}{2}\right)\left(-\frac{1}{2}\right)$

$= -\frac{7}{8}$

$f(0) = 4$

$f(2) = 0$

$g(x) = a(x-h)^2 + K$

$g(0) = ah^2 + K = 4$

$g(2) = a(2-h)^2 + K = 0$

$a(4 - 4h + h^2) + K = 0$

$ah^2+k=4$

ax^2+bx+c

$g(0)=4 \Rightarrow c=4$

$g(2)=0$

$a(2)^2+b(2)+4=0$

$g(3/2)=-\frac{7}{8}$ $\quad 4a+2b=-4$

$a(\frac{3}{2})^2+b(\frac{3}{2})+4=-\frac{7}{8}$

$\frac{9}{4}a+\frac{3}{2}b+4=-\frac{7}{8}$

$18a+12b+32=-7$

$18a+12b=-39$

$-6(4a+2b=-4)$

$-24a-12b=24$

$-6a=-15$

$a=\frac{15}{6}=\frac{5}{2}$

$4a+2b=-4$

$4(\frac{5}{2})+2b=-4$

$10+2b=-4$

$2b=-14$

$b=-7$

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

$f(x)=(x+2)(x-1)(x-2)$

find area bdd by these two.

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

$f(x) = (x+2)(x-1)(x-2)$ } find area bdd by these two.

$= (x+2)(x^2 - 3x + 2)$

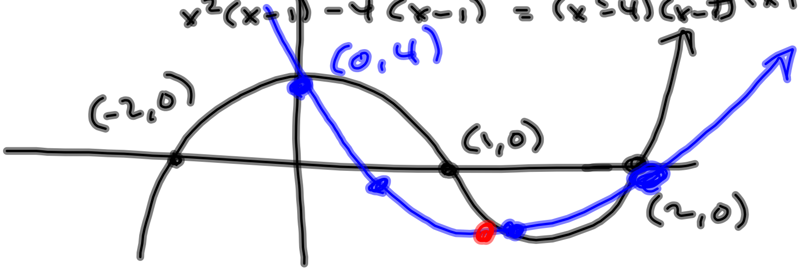
$= x^3 - 3x^2 + 2x + 2x^2 - 6x + 4$

$f(x) = x^3 - x^2 - 4x + 4$

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

$5x - 7$

$x^2(x-1) - 4(x-1) = (x^2-4)(x-1)$ $f(x)$



$$\int_0^{\frac{3}{2}} (f-g) + \int_{\frac{3}{2}}^{2} (g-f)$$

$\frac{5}{2}x^2 - 7x + 4 = g(x) \overset{\text{set}}{=} 0$

$a = \frac{5}{2},\ b = -7,\ c = 4$

$b^2 - 4ac = (-7)^2 - 4(\frac{5}{2})(4) = 9$

$x = \frac{7 \pm \sqrt{9}}{2(\frac{5}{2})} = \frac{7 \pm 3}{5}$ ↗ 2 ↘ $\frac{4}{5}$

$\frac{5}{2}x^2 - 7x + 4 = x^3 - x^2 - 4x + 4$ to find intersection

$\frac{5}{2}(x - \frac{4}{5})\cancel{(x-2)} = (x+2)(x-1)\cancel{(x-2)}$

$\frac{5}{2}(x - 4/5) = x^2 + x - 2$

$\frac{5}{2}x - 2 = x^2 + x - 2$

$x^2 - \frac{3}{2}x = 0$

$x(x - \frac{3}{2}) = 0$

$x = 0 \quad x = \frac{3}{2}$

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$$\frac{d}{dx}\boxed{\int_0^7 (3x+2)\,dx} = \frac{d}{dx}\left[\text{real }\#\right] = 0$$

$$\frac{d}{dx}\int_0^x (3t+2)\,dt = \frac{d}{dx}\left[\frac{3}{2}t^2+2t\right]_0^x$$

$$= \frac{d}{dx}\left[\frac{3}{2}x^2+2x - \cancel{\left(\frac{3}{2}(0)^2+2(0)\right)}\right]$$

$$= 3x+2$$

Chain Rule + FTC I

$$\frac{d}{dx}\int_0^{x^3} (3t+2)\,dt = \frac{d}{dx}\left[\frac{3}{2}t^2+2t\right]_0^{x^3}$$

$$= \frac{d}{dx}\left[\frac{3}{2}(x^3)^2 + 2(x^3)\right]$$

$$= \frac{d}{dx}\left[\frac{3}{2}x^6 + 2x^3\right] = 9x^5 + 6x^2$$

$$= \underbrace{\left(3x^3+2\right)}_{\frac{df}{dx^3}}\underbrace{\left(3x^2\right)}_{\frac{dx^3}{dx}}$$

$$f(x) = \int_0^x (3t+2)\,dt$$

$$f(x^3) = \int_0^{x^3} (3t+2)\,dt$$

$$\frac{d}{dx}\int_0^{\sin x} \sqrt{t^2+17t-11}\,\cos(\pi t)\,dt$$

$$= \sqrt{(\sin x)^2 + 17\sin x - 11}\,\cos(\pi \sin x)\cos x$$

on its domain.

$$\frac{d}{dx}\int_0^{x^4} \frac{t^2-7t+22}{t^4+27}\,dt$$

$$= \left(\frac{(x^4)^2-7x^4+22}{(x^4)^4+27}\right)4x^3$$

$$y = (x^3+4x^2)^5 = f(g(x))$$

$$f(x) = x^5$$

$$g(x) = x^3+4x^2$$

$$\frac{dy}{dx} = \frac{df}{dg}\cdot\frac{dg}{dx} = 5(x^3+4x^2)^4(3x^2+8x)$$

$$\frac{d}{dx}\int_0^{x}(3t+2)\,dt$$

$$\underline{d}\int_0^{x^3+4x^2}(3t+2)\,dt$$

$f := x \rightarrow expand((x+2)\cdot(x-1)\cdot(x-2))$

$$x \rightarrow expand((x+2)\ (x-1)\ (x-2)) \qquad (1)$$

$f(x)$

$$x^3 - x^2 - 4x + 4 \qquad (2)$$

$g := x \rightarrow \frac{5}{2}\cdot x^2 - 7\cdot x + 4$

$$x \rightarrow \frac{5}{2}x^2 - 7x + 4 \qquad (3)$$

$h := x \rightarrow f(x) - g(x)$

$$x \rightarrow f(x) - g(x) \qquad (4)$$

$a := \int_0^{\frac{3}{2}} h(x)\, \mathrm{d}x$

$$\frac{45}{64} \qquad (5)$$

$b := \int_{\frac{3}{2}}^{2} -h(x)\, \mathrm{d}x$

$$\frac{7}{192}$$

$a + b$

$$\frac{71}{96}$$

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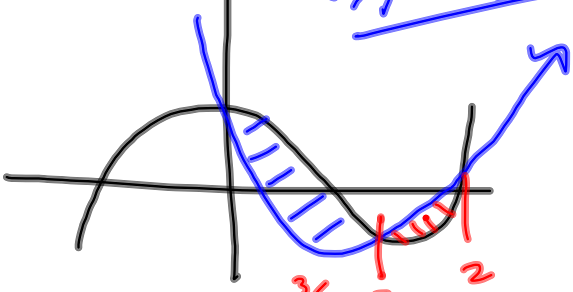
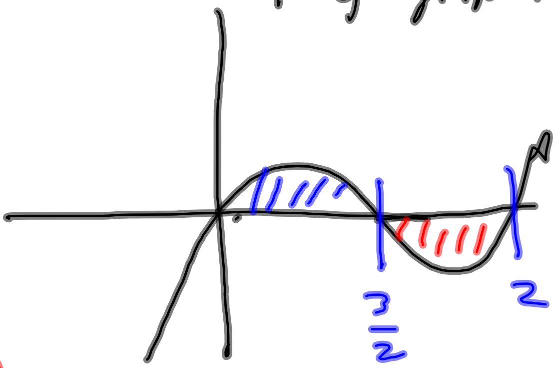
when I ask the "area between"
Just graph the difference func. &
find area bdd between f-g &
x-axis

f, g together



$$\int_0^{3/2}(f-g) + \int_{3/2}^{2}(g-f)$$

f-g graph



$x^2y + 3xy^2 = 4$

Find eq'n of tangent to this curve @ the point $(1,1)$

Build a question

$x=1 \Longrightarrow 1y + 3y^2 = 4$

$3y^2 + y - 4 = 0$

$(3y+4)(y-1) = 0$

$y = -\frac{4}{3},\ y = 1$

$(fg)' = f'g + fg'$

$\frac{d}{dx}[x^2y] = 2xy + x^2y'$

$f = x^2 \quad f' = 2x$

$g = y \quad g' = y'$

$\frac{d}{dx}\left[x^2y + 3xy^2 = 4\right]$

$2xy + x^2y' + 3y^2 + 6xyy' = 0$

$f'g + fg' \qquad f'g + fg'$

$y' = \frac{-2xy - 3y^2}{x^2 + 6xy}$

$y'(x^2+6xy) = \sim$

$y' = \frac{\sim}{x^2+6xy}$

$y'\Big|_{(1,1)} = \frac{-2-3}{1+6} = \frac{-5}{7} = m$

$y = -\frac{5}{7}(x-1) + 1$