

Homework:

pg 197 5,8,23,25,33,37,41a,42c,45a,61,75

pg 202 5,15,19,26c,27,31

pg 208 7,23,35,41,45,49,65

$$5) \frac{dy}{dx} = \underline{0} \quad 8) \frac{dy}{dx} = \frac{1}{5}(2x+0) = \underline{\frac{2}{5}x}$$

$$23) \frac{dx}{dt} = \frac{(2t+1)(3) - 3t(2)}{(2t+1)^2} = \frac{6t+3-6t}{(2t+1)^2} = \frac{3}{(2t+1)^2}$$

$$25) \frac{dy}{dx} = \frac{(x+3)(2) - (2x-1)(1)}{(x+3)^2} = \frac{2x+6-2x+1}{(x+3)^2} = \frac{7}{(x+3)^2}$$

$$\frac{dy}{dx} \Big|_{x=1} = \frac{7}{(1+3)^2} = \underline{\frac{7}{16}} = f'(1)$$

$$33) \text{ Volume} = \frac{4}{3} \pi r^3$$

$$\frac{dV}{dr} = 4\pi r^2 \quad \left. \frac{dV}{dr} \right|_{r=5} = 100\pi$$

$$37) \text{ a) } F'(x) = 5f'(x) + 2g'(x) \quad F'(2) = 5 \cdot 4 + 2(-5)$$

$$\text{b) } F'(2) = f'(2) - 3g'(2) = 4 - 3(-5) = \underline{19}$$

$$\text{c) } F'(2) = f(2)g'(2) + g(2)f'(2) = (-1)(-5) + (1)(4)$$

$$\text{d) } F'(2) = \frac{g'(2)f'(2) - f(2)g'(2)}{(g(2))^2} = \frac{(1)(4) - (-1)(-5)}{1^2} = \underline{-1}$$

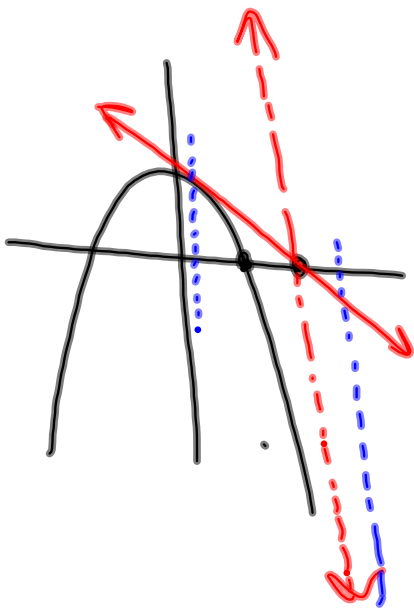
$$\begin{aligned} 41 a) \quad f(x) &= 7x^3 - 5x^2 + x \\ f'(x) &= 21x^2 - 10x + 1 \\ f''(x) &= 42x - 10 \end{aligned}$$

$$\begin{aligned} 42 c) \quad f(x) &= \frac{3x-2}{5x} & f'(x) &= \frac{5x(3) - (3x-2)(5)}{25x^2} \\ &= \frac{15x - (15x - 10)}{25x^2} & &= \frac{10}{25x^2} = \frac{2}{5x^2} = \frac{2}{5}x^{-2} \end{aligned}$$

$$f''(x) = -\frac{4}{5}x^{-3} = -\frac{4}{5x^3}$$

45 a) $f(x) = 3x^2 - 2$ $f'(x) = 6x$ $f''(x) = 6$ $f'''(x) = 0$

61) $f(x) = 1 - x^2$
 $f'(x) = -2x$



$(2, 0)$

$Y - Y_0 = (-2x)(x - x_0)$

$Y = -2x(x - 2)$

$Y = -2x^2 + 4x$

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

$x^2 - 4x + 1 = 0$

$2 \pm \sqrt{3}$ $.3, 3.7$

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$$5) f(x) = x^3 \sin x - 5 \cos x$$

$$f'(x) = x^3 (\cos x) + (\sin x) 3x^2 + 5 \sin x$$
$$= x^3 \cos x + 3x^2 \sin x + 5 \sin x$$

$$19) \quad y = x \cos x$$

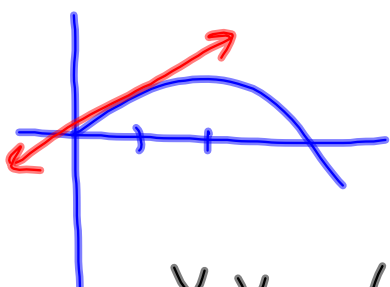
$$y' = -x \sin x + (\cos x) \cdot 1$$

$$y' = \cos x - x \sin x$$

$$y'' = -\sin x - (x \cos x + \sin x)$$

$$= -2\sin x - x \cos x$$

26 c) $f(x) = \sin x$ $x = \frac{\pi}{4}$



$$f'(x) = \cos x$$

$$f(x) = \sin x$$

$$f'\left(\frac{\pi}{4}\right) = \cos \frac{\pi}{4} = \frac{1}{\sqrt{2}}$$

$$f\left(\frac{\pi}{4}\right) = \sin \frac{\pi}{4} = \frac{1}{\sqrt{2}}$$

$$y - y_0 = m(x - x_0)$$

$$y - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}} \left(x - \frac{\pi}{4} \right)$$

$$y = \frac{1}{\sqrt{2}} x - \frac{\pi}{4\sqrt{2}} + \frac{1}{\sqrt{2}} \implies 4\sqrt{2} y = 4x - \pi + 4$$

$$4x - 4\sqrt{2} y - \pi + 4 = 0$$

paos

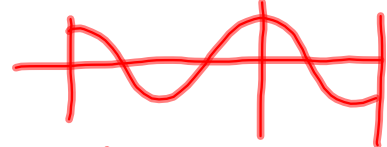
$$45) f(x) = x \cos 3x \quad x = \pi$$
$$f'(x) = -(x \sin 3x)' + \cos 3x$$

$$y - (-\pi) = -1(x - \pi)$$

$$y + \pi = -x + \pi$$

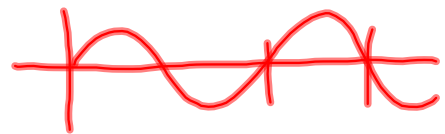
$$y = -x$$

$$f(\pi) = \pi \cos 3\pi$$
$$= -\pi$$



$$f'(\pi) =$$

$$= -3\pi \sin 3\pi + \cos 3\pi$$



$$= -1$$

$$65) \quad f'(0)=2 \quad g(0)=0 \quad g'(0)=3$$

$$(f \circ g)'(0)$$

$$(f \circ g)(x)$$

$$f(g(x))$$

$$\text{chain} \Rightarrow f'(g(x)) \cdot g'(x) \rightsquigarrow f'(0) \cdot 3 = 2 \cdot 3 = 6$$

$$\frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx}$$