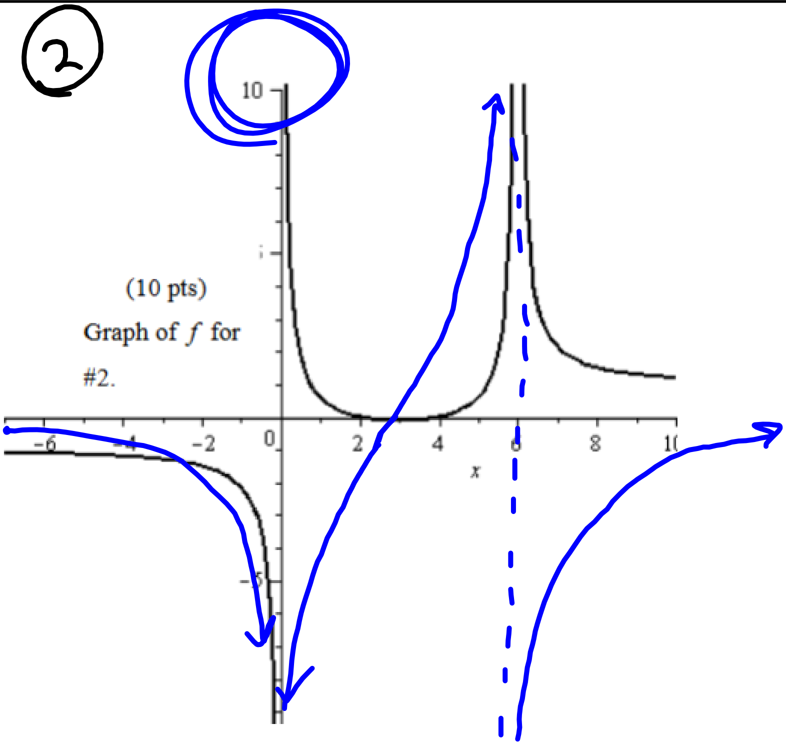
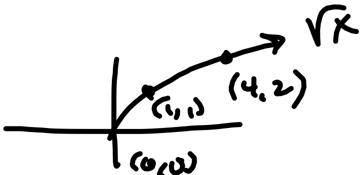
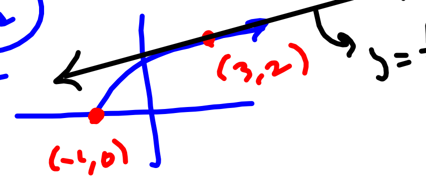
2



$f(x) = \sqrt{x+1} = (x+1)^{\frac{1}{2}}$



12



$y = \frac{1}{4}(x-3)+2$

$f'(x) = \frac{1}{2}(x+1)^{-\frac{1}{2}} = \frac{1}{2\sqrt{x+1}}$

$f'(3) = \frac{1}{2\sqrt{3+1}} = \frac{1}{4}$

$m = \frac{y_2-y_1}{x_2-x_1} = \frac{y-y_1}{x-x_1}$

$y = m(x-x_1)+y_1$

$\boxed{y = \frac{1}{4}(x-3)+2}$

$m(x-x_1) = y-y_1$

$y-y_1 = m(x-x_1)$

$\underline{y = m(x-x_1)+y_1}$

(a) $x^5 \cancel{- 6x^{4/3} + 6\sqrt[3]{x^7}} + 4x^{\frac{2}{5}} - \frac{3}{2}x^{-\frac{2}{3}}$

$6x^{7/3}$

$= x^5 + 4x^{\frac{2}{5}} - \frac{3}{2}x^{-2/3}$

$\Rightarrow f'(x) = 5x^4 + \frac{8}{5}x^{-\frac{3}{5}} + x^{-\frac{5}{3}}$

(b) $h(w) = (w^2+3w+13)(w^3-7w^2)$

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

$\Rightarrow h'(w) = (2w+3)(w^3-7w^2)$
$+ (w^2+3w+13)(3w^2-14w)$

(c) $H(t) = \dfrac{t^2+3t}{t^2+6t+14} \longrightarrow$

$\left(\dfrac{f}{g}\right)' = \dfrac{f'g - fg'}{g^2}$

$H'(t) = \dfrac{(2t+3)(t^2+6t+14) - (t^2+3t)(2t+6)}{(t^2+6t+14)^2}$

(d) $g(x) = (x^2+3x+13)^3(x^3-7x^2)^{-5} \longrightarrow$

$g'(x) = 3(x^2+3x+13)^2(2x+3)(x^3-7x^2)^{-5}$
$+ (x^2+3x+13)^3(-5)(x^3-7x^2)^{-6}(3x^2-14x)$

Need

(e) $r(x) = \dfrac{(x^2+3x+13)^3}{(x^3-7x^2)^5} =$ (d)

$= (x^2+3x)^3(x^3-7x^2)^{-5}$

(f) $Q(t) = \dfrac{\sin(t^2-3t)}{\cos(5t)} \longrightarrow$

$Q'(t) = \dfrac{(\cos(t^2-3t))(2t-3)\cos(5t) - (\sin(t^2-3t))(-\sin(5t))(5)}{(\cos^2(5t))}$

(9) $R(x) = \dfrac{\csc^3(5x)}{\tan(\pi x)} \Rightarrow (f'g)$

$$R'(x) = \frac{(3\csc^2(5x))(-\csc(5x)\cot(5x))(5)\tan(\pi x)}{(\tan(\pi x))^2}$$

fg'

$$- \frac{(\csc^3(5))(\sec^2(\pi x))(\pi)}{(\tan(\pi x))^2}$$

(4) $f(x) = x^3 - 6x^2 + 15x - 7$ has no slope of $m = -2$

$\Rightarrow f'(x) = 3x^2 - 12x + 15 \overset{SET}{=} -2$

$\Rightarrow 3x^2 - 12x + 17 = 0$

Discriminant $a = 3, b = -12, c = 17$

$\boxed{b^2 - 4ac} = (-12)^2 - 4(3)(17)$

$= 144 - 204 = -60 < 0$

$$\boxed{x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$$

$\sqrt{-60} \notin \mathbb{R}$

No real sol'n

5) $y\sin(2x) = x\cos(2y)$

a) Find $y' = \frac{dy}{dx}$

$$y'\sin(2x) + y\,2\cos(2x) = 1\cos(2y) + xy'(-2\sin(2y))$$

$$y'\sin(2x) + y'x(2\sin(2y)) = \cos(2y) - 2y\cos(2x)$$

$$y'(\sin(2x) + 2x\sin(2y)) = \_\_\_\_\_\_$$

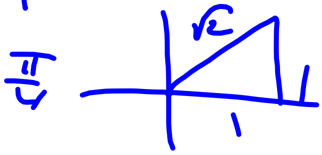
$$y' = \frac{\cos(2y) - 2y\cos(2x)}{\sin(2x) + 2x\sin(2y)}$$

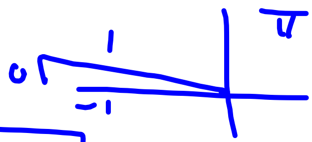
$$y'\Big|_{\left(\frac{\pi}{2},\frac{\pi}{4}\right)} = \frac{\cos\left(2\left(\frac{\pi}{4}\right)\right) - 2\left(\frac{\pi}{4}\right)\cos\left(2\left(\frac{\pi}{2}\right)\right)}{\sin\left(2\left(\frac{\pi}{2}\right)\right) + 2\left(\frac{\pi}{2}\right)\left(\sin\left(2\left(\frac{\pi}{4}\right)\right)\right)}$$

$$\frac{d}{dx}\left[\cos(2y)\right] = (-\sin(2y))(2y')$$

$$= \frac{\cos\left(\frac{\pi}{2}\right) - \frac{\pi}{2}\cos(\pi)}{\sin(\pi) + \pi\sin\left(\frac{\pi}{2}\right)}$$

$$= \frac{0 - \frac{\pi}{2}(-1)}{0 + \pi(1)} = \frac{\frac{\pi}{2}}{\pi} = \frac{1}{2}$$





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

6) See 10/2 notes!

7) $r = 3 \pm .1 \longrightarrow \Delta r = dr$

$V = \frac{4}{3}\pi r^3$

$\frac{dV}{dr} = 4\pi r^2$

$\Delta V = \frac{4}{3}\pi(3.1)^3 - \frac{4}{3}\pi(3)^3$

$\Delta V \approx dV = 4\pi r^2 dr = 4\pi r^2 \Delta r$

$= 4\pi(3)^2(.1)$

$= 4\pi(9)(\frac{1}{10}) = \frac{36\pi}{10} = \boxed{\frac{18\pi}{5}} \approx$ ______ calc.

b) rel. Error $\frac{\Delta V}{V} \approx \frac{dV}{V}$

$= \frac{\frac{18\pi}{5}}{\frac{4}{3}\pi(3)^3} = \frac{\frac{18\pi}{5}}{\frac{36\pi}{1}} = \frac{18\pi}{36\pi \cdot 5}$

$= \frac{5\pi}{2} \approx$ ______ calculate

$\lim_{x \to 3} (x^2 - 2x + 1) = 4$

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

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

$(x-3)(x+1)$

δ find ceiling

Assume $\delta \le 1$

Then $2 < x < 4$

$3 < x+1 < 5$

$\Rightarrow |x+1| < 5$

Proof Let $\varepsilon > 0$ be given. Define $\delta = \min\{1, \frac{\varepsilon}{5}\}$

Then, $0 < |x-3| < \delta$, we have

$|x^2 - 2x + 1 - 4| = |x^2 - 2x - 3|$

$= |x-3||x+1| < \delta \cdot 5 = 5\delta \le 5 \cdot \frac{\varepsilon}{5} = \varepsilon$ ∎