Quiz 2

Name: key

[12] **1.** Find the derivatives of the following functions. You may use any rule of differentiation.

a) $y = \dfrac{4x}{x^2+4}$

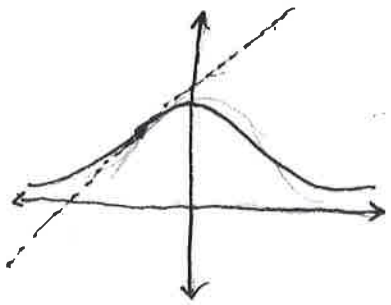
By the quotient rule with $u = 4x$ and $v = x^2+4$,

$$\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2} = \boxed{\frac{(x^2+4)\cdot 4 - 4x\cdot(2x)}{(x^2+4)^2}}$$ (2) (2) (2)

b) $y = \left(x^3 + \dfrac{32}{x^3}\right)^2$. Let $u = x^3 + \dfrac{32}{x3} = x^3 + 32x^{-3}$.

Then $\dfrac{du}{dx} = 3x^2 + 32(-3x^{-4})$, (2) and since $y = u^2$, we have $\dfrac{dy}{dx} = 2u\dfrac{du}{dx} = \boxed{2\left(x^3+\frac{32}{x^3}\right)\left(3x^2 + 32\cdot(-3x^{-4})\right)}$. (2) (2)

[8] **2.** Find the equation of the tangent line to the graph of $f(x) = \dfrac{1}{x^2+1}$ at the point $(-1, \frac{1}{2})$.



With $u = 1$ and $v = x^2+1$,

$\dfrac{dy}{dx} = \dfrac{(x^2+1)\cdot 0 - 1\cdot(2x)}{(x^2+1)^2}$ (2) by the Quotient rule, so at $x = -1$,

$\dfrac{dy}{dx} = \dfrac{-2x}{(x^2+1)^2} = \dfrac{(-2)(-1)}{2^2} = \dfrac{1}{2}$. (3)

The tangent line has slope $\frac{1}{2}$ and passes thru the point $(-1, \frac{1}{2})$, so it has the equation

$$\boxed{\left(y - \tfrac{1}{2}\right) = \tfrac{1}{2}\left(x - (-1)\right)}$$ (3)