Last Name: SOLUTIONS

First Name: _____

Student ID: _____

Quiz 5

Question 1. *(4 marks)* Find the derivatives of the following functions. You may use any method but remember to use correct notation.

(a) $y = \dfrac{x^2+4x+3}{\sqrt{x}} = x^{3/2} + 4x^{1/2} + 3x^{-1/2}$

$\therefore y' = \frac{d}{dx}(x^{3/2}) + 4\frac{d}{dx}(x^{1/2}) + 3\frac{d}{dx}(x^{-1/2})$

$= \frac{3}{2}x^{1/2} + 2x^{-1/2} - \frac{3}{2}x^{-3/2}$

$= \frac{3}{2}x^{1/2} + \frac{2}{x^{1/2}} - \frac{3}{2x^{3/2}}$

(b) $H(x) = (x+x^{-1})^3 = (x+x^{-1})(x+x^{-1})(x+x^{-1})$

$= (x^2 + 2 + x^{-2})(x+x^{-1}) = x^3 + 2x + x^{-1} + x + 2x^{-1} + x^{-3}$

$= x^3 + 3x + 3x^{-1} + x^{-3}$

$\therefore H'(x) = \frac{d}{dx}(x^3) + 3\frac{d}{dx}(x) + 3\frac{d}{dx}(x^{-1}) + \frac{d}{dx}(x^{-3})$

$= 3x^2 + 3 - 3x^{-2} - 3x^{-4}$

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

Question 2. *(6 marks)* Find an equation of the tangent line to the curve $y = x\sqrt{x}$ that is parallel to the line $y = 1 + 3x$.

$y = x^{3/2} \iff y' = \frac{3}{2}x^{1/2}$

SLOPE OF $y = 1+3x$ IS $m=3$ SO THE SLOPE OF OUR TANGENT LINE SHOULD BE THE SAME

$y' = \frac{3}{2}x^{1/2} = 3 \iff x^{1/2} = 2 \iff x = 4$

$\therefore y = 4\sqrt{4} = 8$

SO THE SLOPE OF THE TANGENT LINE TO $y = x\sqrt{x}$ IS $m=3$ AT $(4,8)$.

$y = mx + b$

$8 = 3(4) + b$

$-4 = b$

$\therefore \boxed{y = 3x - 4}$ EQUATION OF TANGENT.