Mathematics 122 Quiz 19 Name: Key

(1) Let a and b be constants.

1 pt (a) $P(t) = 4e^t + 9\ln(t) + \dfrac{3}{t^4}$. $P'(t) =$ $4e^t + \frac{9}{t} - 12t^{-5}$

$= 4e^t + 9\ln(t) + 3t^{-4}$

1 pt (b) $w = 3ab^3z^4 + b^2a^x + 9a^{17}b^9$. $\dfrac{dw}{dz} =$ $12ab^3z^3 + b^2\ln(a)a^x$

constant so its derivative $= 0$

(2) Let $f(x) = \sqrt{x}$.

1 pt (a) Find the equation of the tangent line to $y = f(x)$ where $x = 4$. (Note this asks for an equation, thus if there is no equal sign in your answer, it is wrong.)

$y = f(a) + f'(a)(x-a)$

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

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

$a = 4$

$f(a) = \sqrt{4} = 2$ $\quad f'(a) = \frac{1}{2}(4)^{-\frac{1}{2}} = \frac{1}{2\sqrt{4}} = \frac{1}{4}$

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

1 pt (b) Use the tangent line to approximate $\sqrt{4.1}$.

$y = 2 + \frac{1}{4}(4.1-4)$

$= 2 + \frac{1}{4}(.1)$

$= 2.025$

$\sqrt{4.1} \approx$ 2.025

1 pt (c) What is the value of $\sqrt{4.1}$ given by your calculator to 5 decimals places.

2.02484 56731

Graph of $y = \sqrt{x}$ and its tangent line at $x = 4$ between $x = 3$ and $x = 5$ showing why the tangent line gives a good approximation to $\sqrt{x}$ for x close to 4.