Math 157 - Quiz 6

October 5, 2016

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (4 points) Determine the derivative of each function.

(a) $f(t) = \frac{1}{t} + 7e^{-3t}$ $= t^{-1} + 7e^{-3t}$

$f'(t) = -t^{-2} - 21e^{-3t} = -\frac{1}{t^2} - 21e^{-3t}$

(b) $y = 5x^2 - 8x + 3 - 9\ln x$

$\frac{dy}{dx} = 10x - 8 - \frac{9}{x}$

2. (4 points) Find an equation of the line tangent to the graph of $f(x) = 2 + \sqrt[3]{x}$ at the point where $x = 8$.

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

Slope: $f'(x) = \frac{1}{3}x^{-2/3} = \frac{1}{3\sqrt[3]{x^2}}$

$m = f'(8) = \frac{1}{3\sqrt[3]{64}} = \frac{1}{12}$

Point: $x = 8$, $y = f(8) = 2 + \sqrt[3]{8} = 4$

$(8, 4)$

Line:

$y - 4 = \frac{1}{12}(x - 8)$ or $y = \frac{1}{12}x + \frac{10}{3}$

3. (2 points) A bacteria culture is growing in such a way that after t hours there are $P(t) = 145e^{0.2t}$ bacteria. Find the instantaneous rate of change when $t = 5$. Give units with your answer.

$P'(t) = 145(0.2)e^{0.2t}$

$P'(5) = 145(0.2)e^{(0.2)(5)}$

≈ 78.83 bacteria/hour