Name: Richard

MATH 200 – QUIZ 6 ☽

Instructions: Show work and put a $\boxed{\text{box}}$ around your final answer.

February 21, 2013

1. Suppose $f(x) = \sqrt[3]{x}^2$. $= x^{2/3}$

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

   (b) Find the equation of the tangent line to the graph of $f(x)$ at the point $(8, f(8))$. $= (8, \sqrt[3]{8}^2) = (8, 2^2) = (8, 4)$

   Point on tangent: $(8, 4)$

   Slope of tangent: $f'(8) = \frac{2}{3\sqrt[3]{8}} = \frac{2}{3 \cdot 2} = \frac{1}{3}$

   Point-slope formula: $y - y_0 = m(x - x_0)$

   $y - 4 = \frac{1}{3}(x - 8)$

   $y - 4 = \frac{1}{3}x - \frac{8}{3}$

   $y = \frac{1}{3}x - \frac{8}{3} + 4$

   $\boxed{y = \frac{1}{3}x + \frac{4}{3}}$

2. Suppose $g(t) = \frac{t^2}{t+1}$.

   (a) $g'(t) = \frac{2t(t+1) - t^2(1)}{(t+1)^2} = \frac{t^2 + 2t}{(t+1)^2}$

   (b) An object moving on a straight line is $g(t)$ feet from its starting position at time t seconds. Find its velocity at time $t = 2$ seconds. (Include units in your final answer.)

   $g'(2) = \frac{2^2 + 2 \cdot 2}{(2+1)^2} = \boxed{\frac{8}{9} \text{ feet per second}}$

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1. Suppose $f(x) = (3x + 4)e^x$.

   (a) $f'(x) = \boxed{3e^x + (3x+4)e^x} = (3 + 3x + 4)e^x = \boxed{(3x+7)e^x}$

   (b) Find the equation of the tangent line to the graph of $f(x)$ at the point $(0, f(0))$. $= (0, (3 \cdot 0 + 4)e^0) = (0, 4)$

   Point on tangent: $(0, 4)$

   Slope of tangent: $f'(0) = (3 \cdot 0 + 7)e^0 = 7 \cdot 1 = 7$

   Point-slope formula: $y - y_0 = m(x - x_0)$

   $y - 4 = 7(x - 0)$

   $\boxed{y = 7x + 4}$

2. Suppose $g(t) = t^2 + \sqrt{t}$. $= t^2 + t^{1/2}$

   (a) $g'(t) = 2t + \frac{1}{2}t^{\frac{1}{2}-1} = 2t + \frac{1}{2}t^{-1/2} = 2t + \frac{1}{2t^{1/2}} = \boxed{2t + \frac{1}{2\sqrt{t}}}$

   (b) An object moving on a straight line is $g(t)$ feet from its starting point at time t seconds. Find its velocity at time $t = 9$ seconds. (Include units in your final answer.)

   $g'(9) = 2 \cdot 9 + \frac{1}{2\sqrt{9}} = 18 + \frac{1}{6} = \frac{108}{6} + \frac{1}{6} = \boxed{\frac{109}{6} \text{ feet per second}}$

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MATH 200 – QUIZ 6 ☆

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1. Suppose $f(x) = \dfrac{e^x}{x-1}$.

   (a) $f'(x) = \dfrac{e^x(x-1) - e^x(1-0)}{(x-1)^2} = \dfrac{e^x(x-1-1)}{(x-1)^2} = \boxed{\dfrac{e^x(x-2)}{(x-1)^2}}$

   (b) Find the equation of the tangent line to the graph of $f(x)$ at the point $(0, f(0))$. $= \left(0, \frac{e^0}{0-1}\right) = \left(0, \frac{1}{-1}\right) = (0,-1)$

   Point on tangent: $(0,-1)$

   Slope of tangent: $f'(0) = \dfrac{e^0(0-2)}{(0-1)^2} = \dfrac{1\cdot(-2)}{1} = -2$

   Point-slope formula: $y - y_0 = m(x - x_0)$

   $y-(-1) = -2(x-0)$

   $\boxed{y = -2x-1}$

2. Suppose $g(t) = \sqrt{t} + t^2 + 3$.

   (a) $g'(t) = \frac{1}{2}t^{-1/2} + 2t + 0 = \dfrac{1}{2t^{1/2}} + 2t = \boxed{\dfrac{1}{2\sqrt{t}} + 2t}$

   (b) An object moving on a straight line is $g(t)$ feet from its starting point at time t seconds. Find its velocity at time $t = 4$ seconds. (Include units in your final answer.)

   $g'(4) = \dfrac{1}{2\sqrt{4}} + 2\cdot 4 = \dfrac{1}{4} + 8 = \dfrac{1}{4} + \dfrac{32}{4} = \boxed{\dfrac{33}{4} \text{ feet per second}}$

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Instructions: Show work and put a $\boxed{\text{box}}$ around your final answer.

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1. Suppose $f(x) = 5xe^x + 2$.

   (a) $f'(x) = 5e^x + 5xe^x + 0 = \boxed{5e^x(1+x)}$

   (b) Find the equation of the tangent line to the graph of $f(x)$ at the point $(0, f(0))$. $= (0, 5\cdot 0\cdot e^0 + 2) = (0,2)$

   Point on tangent: $(0,2)$

   Slope of tangent: $f'(0) = 5e^0(1+0) = 5\cdot 1\cdot 1 = 5$

   Point-slope formula: $y - y_0 = m(x-x_0)$

   $y - 2 = 5(x-0)$

   $\boxed{y = 5x+2}$

2. Suppose $g(t) = t + \sqrt[3]{t} + 1$. $= t + t^{1/3} + 1$

   (a) $g'(t) = 1 + \frac{1}{3}t^{-2/3} + 0 = 1 + \dfrac{1}{3t^{2/3}} = \boxed{1 + \dfrac{1}{3\sqrt[3]{t}^{\,2}}}$

   (b) An object moving on a straight line is $g(t)$ feet from its starting point at time t seconds. Find its velocity at time $t = 8$ seconds. (Include units in your final answer.)

   $g'(8) = 1 + \dfrac{1}{3\sqrt[3]{8}^{\,2}} = 1 + \dfrac{1}{3\cdot 2^2} = 1 + \dfrac{1}{12} = \dfrac{12}{12} + \dfrac{1}{12} = \boxed{\dfrac{13}{12} \text{ feet per second}}$