Math 220 (section AD?) Quiz 4 Spring 2014

Name SOLUTIONS

- You have 15 minutes
- No calculators
- Show sufficient work

1. (2 points) Determine the value of $g'(\pi/4)$ given that $g(x) = 10\sin x + 4\cos x + 100$.

$$g'(x) = 10\cos(x) - 4\sin(x)$$
$$g'\left(\tfrac{\pi}{4}\right) = 10\cos\left(\tfrac{\pi}{4}\right) - 4\sin\left(\tfrac{\pi}{4}\right)$$
$$= 10\left(\tfrac{\sqrt{2}}{2}\right) - 4\left(\tfrac{\sqrt{2}}{2}\right)$$
$$= 5\sqrt{2} - 2\sqrt{2}$$
$$= 3\sqrt{2}$$

2. (2 points) Determine the equation of the line which is tangent to the curve

$$y = 2e^x - 6 \quad \Rightarrow y' = 2e^x$$

at its $x$-intercept.

To find x-int, set $y=0$

$0 = 2e^x - 6$

$6 = 2e^x$

$3 = e^x$

$\ln(3) = x$

point: $(\ln(3), 0)$

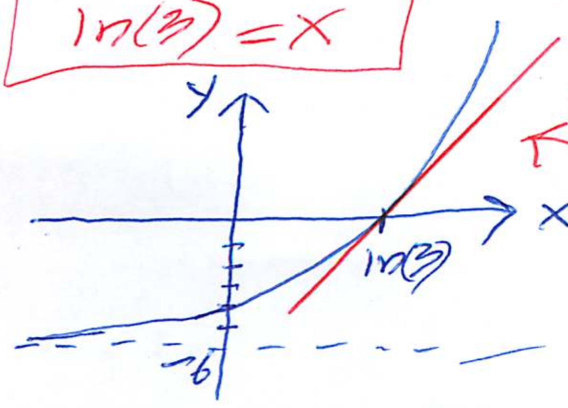
slope: $y'(\ln(3)) = 2e^{\ln(3)}$

$= 2\cdot 3$

$= 6$

$$y - 0 = 6(x - \ln(3))$$

$$y = 6x - 6\ln(3)$$



3. (2 points each) Using Leibniz notation (i.e., $\frac{dy}{dx}$, $\frac{dP}{dt}$, etc.), find derivatives for each of the following functions.

(a) $y = \left(\frac{x\sqrt{x}}{\sqrt[6]{x}}\right)^3$ (simplify your answer)

$y = \left(\frac{x \cdot x^{1/2}}{x^{1/6}}\right)^3 = \left(\frac{x^{3/2}}{x^{1/6}}\right)^3 = \left(x^{\frac{3}{2}-\frac{1}{6}}\right)^3$

$= \left(x^{\frac{9}{6}-\frac{1}{6}}\right)^3 = \left(x^{8/6}\right)^3 = \left(x^{4/3}\right)^3 = x^4$

$\frac{dy}{dx} = 4x^3$

(b) $\theta = \frac{8\tan t}{t^5+6}$

$\frac{d\theta}{dt} = \frac{\frac{d}{dt}(8\tan(t)) \cdot (t^5+6) - (8\tan(t)) \cdot \frac{d}{dt}(t^5+6)}{(t^5+6)^2}$

$= \frac{8\sec^2(t) \cdot (t^5+6) - 8\tan(t) \cdot 5t^4}{(t^5+6)^2}$

(c) $w = 10q^8e^q + e^{\cos(\pi/13)}$

(note: $e^{\cos(\pi/13)}$ is a constant so has deriv. 0)

$\frac{dw}{dq} = \frac{d}{dq}(10q^8) \cdot (e^q) + (10q^8) \cdot \frac{d}{dq}(e^q) + 0$

$= 80q^7e^q + 10q^8e^q$