Quiz 6

Math 200-A

1. $e^{3x} + 2x + 1 = 1 + 0 + 1 = 2$
   $P_0 = 2$

   $3e^{3x} + 2 = 3 + 2 = 5$
   $P_1 = 2 + \frac{5(x-0)}{1!} = 2 + 5x$

   $9e^{3x} = 9$
   $P_2 = 2 + 5x + \frac{9x^2}{2!}$

2. $f(x) = 4x^3 - 3x^2 + 5x - 1$ $f(2) = 29$
   $f'(x) = 12x^2 - 6x + 5$ $f'(2) = 41$
   $f''(x) = 24x - 6$ $f''(2) = 42$
   $f'''(x) = 24$ $f'''(2) = 24$
   $f''''(x) = 0$ $f''''(2) = 0$

$$29 + 41(x-2) + \frac{42(x-2)^2}{2!} + \frac{24(x-2)^3}{3!}$$

After the third derivative they all are zero.

This is necessary because the series above exactly approximates the real function, which is of 3rd degree.

3. $f(1) = 1$
   $f'(1) = -2x^{-3} = -2$
   $f''(1) = 6x^{-4} = 6$

$$\sum_{n=0}^{\infty} f(x) = 1 - 2(x-1) + 3(x-1)^2 - \ldots\ldots$$

$$\sum_{n=0}^{\infty} (-1)^n (n+1)(x-1)^n$$

4. $\int_0^1 \int_{y^{1/2}}^{y^4} (x^{1/2} - y^2)dxdy = \int_0^1 (\frac{2}{3}x^{3/2} - y^2 x)_{y^{1/2}}^{y^4} dy$

$\int_0^1 (\frac{2}{3}y^{\frac{3}{4}} - y^{\frac{5}{2}} + \frac{1}{3}y^6)dy = (\frac{8}{21}y^{\frac{7}{4}} - \frac{2}{7}y^{\frac{7}{2}} + \frac{1}{21}y^7)\Big|_0^1 = \frac{8}{21} - \frac{2}{7} + \frac{1}{21} = \frac{1}{7}$

5. $\int_0^1 \int_x^{2-x} (x^2 + y^2)dydx = \int_0^1 (x^2 y + \frac{y^3}{3})\Big|_x^{2-x} dx =$

$\int_0^1 (x^3 + \frac{1}{3}x^3 - 2x^2 + x^3 - \frac{1}{3}(2-x)^3)\Big|dx = \int_0^1 (\frac{8}{3}x^3 - 4x^2 + 4x - \frac{8}{3})dx =$

$\frac{8}{12}x^4 - \frac{4}{3}x^3 + \frac{4}{2}x^2 - \frac{8}{3}x\Big|_0^1 = -\frac{2}{3} + \frac{4}{3} - 2 + \frac{8}{3} = \frac{4}{3}$