Math 1210-1
Quiz 6 SOLUTIONS
February 26, 2016

<u>1a)</u> (2 points) For $y = \sqrt{x}$, compute dy in terms of x and dx.
<u>solution:</u>

$$dy = f'(x)\,dx$$
$$= \frac{1}{2} x^{-\frac{1}{2}}\,dx = \frac{1}{2\sqrt{x}}\,dx\,.$$

<u>1b)</u> (3 points) Use differentials to approximate $\sqrt{24}$, using the fact that $\sqrt{25} = 5$.
<u>solution:</u> for

$$x = 25,\ dx = -1,\ y = f(25) = 5$$

we get

$$dy = \frac{1}{2\sqrt{25}}(-1) = -\frac{1}{10}$$
$$\sqrt{24} \approx y + dy = 5 - \frac{1}{10} = 4.9.$$

<u>2)</u> (5 points) Use critical point analysis to find the maximum and minimum values of $f(x) = 2x^3 + 3x^2 - 12x$ on the interval $[-2, 2]$.
<u>solution:</u> Since we have a continuous function on a bounded closed interval the max and min values will occur at endpoints or stationary points.

$$f'(x) = 6x^2 + 6x - 12 = 6\left(x^2 + x - 2\right) = 6(x+2)(x-1).$$

So $x = -2$, $x = 1$ are stationary points (although $x = -2$ is already an endpoint).

$$f(-2) = -16 + 12 + 24 = 20$$
$$f(1) = 2 + 3 - 12 = -7$$
$$f(2) = 16 + 12 - 24 = 4.$$

So the maximum value of f on the interval $[-2, 2]$ is 20 (and it occurs at $x = -2$). The minimum value is -7 (and it occurs at $x = 1$).