Math 171 - Quiz 1

August 23, 2012

Name key

Score _____

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

1. (3 points) Find all solutions: $2(x^2+3x+2)^2+2(2x+1)(2x+3)(x^2+3x+2)=0$

$$2(x^2+3x+2)\left[(x^2+3x+2)+(2x+1)(2x+3)\right]=0$$

$$2(x^2+3x+2)(x^2+3x+2+4x^2+8x+3)=0$$

$$2(x^2+3x+2)(5x^2+11x+5)=0$$

$$2(x+1)(x+2)(5x^2+11x+5)=0$$

$x+1=0 \Rightarrow x=-1$

$x+2=0 \Rightarrow x=-2$

$5x^2+11x+5=0 \Rightarrow x=\dfrac{-11\pm\sqrt{21}}{10}$ ← From Quadratic Formula

2. (2 points) Find an equation of the line passing through $(2,3)$ and $(-5,9)$. Write your final answer in standard form.

$$m=\frac{9-3}{-5-2}=\frac{6}{-7}=-\frac{6}{7}$$

Using $(2,3)$...

$$y-3=-\frac{6}{7}(x-2)$$

$$7y-21=-6(x-2)$$

$$7y-21=-6x+12$$

$$\boxed{6x+7y=33}$$

3. (2 points) Rationalize the numerator: $\dfrac{3+\sqrt{2x-1}}{5-x} \cdot \dfrac{3-\sqrt{2x-1}}{3-\sqrt{2x-1}}$

$$= \frac{9-(2x-1)}{(5-x)(3-\sqrt{2x-1})} = \frac{10-2x}{(5-x)(3-\sqrt{2x-1})} \quad \leftarrow 2(5-x)$$

$$= \boxed{\frac{2}{3-\sqrt{2x-1}}}$$

4. (3 points) Find and simplify the expression for $\Delta y/\Delta x$. Hint: Rationalize the numerator.

$$y = f(x) = \frac{1}{\sqrt{x}}$$

$$\Delta y = f(x+\Delta x) - f(x) = \underbrace{\frac{1}{\sqrt{x+\Delta x}} - \frac{1}{\sqrt{x}}}_{\text{Common Denom}} = \frac{\sqrt{x}-\sqrt{x+\Delta x}}{\sqrt{x}\left(\sqrt{x+\Delta x}\right)}$$

Rationalize Numerator

$$= \frac{\sqrt{x}-\sqrt{x+\Delta x}}{\sqrt{x}\left(\sqrt{x+\Delta x}\right)} \cdot \frac{\sqrt{x}+\sqrt{x+\Delta x}}{\sqrt{x}+\sqrt{x+\Delta x}} = \frac{x-(x+\Delta x)}{\sqrt{x}\left(\sqrt{x+\Delta x}\right)\left(\sqrt{x}+\sqrt{x+\Delta x}\right)} = \frac{-\Delta x}{\sqrt{x}\sqrt{x+\Delta x}\left(\sqrt{x}+\sqrt{x+\Delta x}\right)}$$

So,

$$\boxed{\frac{\Delta y}{\Delta x} = \frac{-1}{\sqrt{x}\sqrt{x+\Delta x}\left(\sqrt{x}+\sqrt{x+\Delta x}\right)}}$$