Math1220 Fall, 2016
Calculus Carnival Alternate Extra Credit

Special Number: ________________

Instructions: You will get full extra credit points (the same as for those students who attended the Calculus Carnival) if you do all of these problems. Please use your own paper to work the problems and staple this page as the cover page to your problems. It is due in class on Monday, November 21st. There is no other time you can turn this in to get the extra credit points. (Note: These are all problems from Calc 1 since that was most of what was covered in the carnival.)

1. Find each limit, if it exists.

(a) $\lim_{x\to\infty} \frac{\sqrt[3]{2x^2+x^4+5x^9}}{2x^3+3x-7}$

(b) $\lim_{x\to 5} \frac{\frac{1}{\sqrt{x-4}}-\sqrt{x-4}}{4(x-5)}$

(c) $\lim_{x\to 0} \frac{\sin(3x)-5x}{\tan(2x)}$

2. Find the equation of the tangent line to the curve $f(x)=3x^4+4x^3+2x^2+1$ at $x=-1$.

3. Evaluate these integrals.

(a) $\int_1^4 \frac{y^2+3}{y^2}\,dy$

(b) $\int_0^{\frac{\pi}{6}} 2\sin^2\theta\cos\theta\,d\theta$

4. Find the indicated derivative of the given functions. (do NOT simplify your answers.)

(a) $\frac{d}{dx}\left(\frac{x^4-\cos x}{x-\frac{5}{x}}\right)$

(b) $\frac{dy}{dx}$ given $y^2-\sqrt{xy}+2x=7$

5. A student is using a straw to drink from a conical paper cup, whose axis is vertical, at a rate of 4 cubic centimeters a second. If the height of the cup is 12 centimeters and the diameter of its opening is 8 centimeters, how fast is the radius of the liquid changing when the depth of the liquid is 5 cm? (Hint: this is related rates problem.)

6. A veterinarian has 132 feet of fencing and wishes to construct five dog kennels by first building a fence around a rectangular region, and then subdividing that region into five smaller rectangles by placing four fences parallel to one of the sides. What dimensions of the overall rectangular region will maximize the total area? (Hint: this is a min/max problem.)