Math 131 - September 22, 2014
Solutions

Fun Problems

1. Determine the number of 0's that are at the end of:

$$100! = 100 \cdot 99 \cdot 98 \cdot 97 \cdots 3 \cdot 2 \cdot 2 \cdot 1$$

Warm-up Problems

2. What does it mean for a function to be continuous at a point $x = c$?

   Solution: $\lim_{x \to c} f(x) = f(c)$

3. What does it mean for a function to be continuous?

   Solution: This means that the function is continuous at all points in the domain of the function.

4. What does it mean for a function to be differentiable at a point $x = c$?

   Solution: That $f'(c)$ exists, or that $\lim_{h \to 0} \frac{f(c+h)-f(c)}{h}$ exists.

5. What does it mean for a function to be differentiable?

   Solution: This means that the function is differentiable at all points in the domain of the function.

6. Multiply out, simplify, write out your solution nicely organized.

   (a) $(x+h)^2 = x^2 + 2\,xh + h^2$

   (b) $(x+h)^3 = x^3 + 3\,x^2h + 3\,xh^2 + h^3$

   (c) $(x+h)^4 = x^4 + 4\,x^3h + 6\,x^2h^2 + 4\,xh^3 + h^4$

   (d) $(x+h)^5 = x^5 + 5\,x^4h + 10\,x^3h^2 + 10\,x^2h^3 + 5\,xh^4 + h^5$

Lecture Problems

7. Compute the derivatives

   (a) $\dfrac{d}{dx}\left(x^4\right) = 4x^3$

   (b) $\dfrac{d}{dx}\left(\dfrac{1}{x^4}\right) = -4x^{-5}$

   (c) $\dfrac{d}{dx}\left(6x^4\right) = 24x^3$

   (d) $\dfrac{d}{dx}\left(\dfrac{1}{6x^4}\right) = -\dfrac{4}{6}x^{-5}$

   (e) $\dfrac{d}{dx}\left(6x^{102}\right) = 612x^{101}$

   (f) $\dfrac{d}{dx}\left(\dfrac{43x}{x^{99}}\right) = (-43 \cdot 98)x^{-99}$