## Math 151, Quiz # 8 Solutions, October 29, 2013

**1.** Let  $f(x) = x^4 - 32x$ . Find the maximum and minimum values attained by f(x) on the interval [-3,3]. Solution: We compute  $f'(x) = 4x^3 - 32$ . To find the critical points we set  $4x^3 - 32 = 0$ . Rearranging,  $4x^3 = 32$ , so  $x^3 = 8$ . Thus x = 2. The other two critical points are the endpoints of the interval  $\pm 3$ . So we evaluate f at these three points:

$$f(-3) = 81 + 96 = 177$$
$$f(2) = 16 - 64 = -48$$
$$f(3) = 81 - 96 = -15$$

Thus we can see that the maximum is f(-3) = 177 and the minimum is f(2) = -48.

**2.** Let  $g(x) = e^x + x^2 + 1$ . Use a linear approximation about x = 0 to approximate the value of g(0.02). Solution: We compute  $g'(x) = e^x + 2x$ . Thus  $g'(0) = e^0 + 0 = 1$ . Next, we note that  $g(0) = e^0 + 0 + 0 + 1 = 2$ . So we approximate g(x) at the point (0, 2) by a line having slope 1. Thus we have the approximation  $g(x) \approx 1x + 2$ . So  $g(0.02) \approx 1(0.02) + 2 = 2.02$ .