

**Solution of Problem 29 in 13.6 (p. 895) using Maple.**

Here is a rephrasing of the problem: Let

$$f(x, y, z) = \sqrt{x^2 + y^2 + z^2} \quad \text{for } (x, y, z) \in \mathbb{R}^3.$$

Then the standard affine approximation to  $f$  at  $(3, 4, 11)$  is

$$A(x, y, z) = f(3, 4, 11) + \frac{\partial f}{\partial x}(3, 4, 11)(x-3) + \frac{\partial f}{\partial y}(3, 4, 11)(y-4) + \frac{\partial f}{\partial z}(3, 4, 11)(z-11)$$

for  $(x, y, z) \in \mathbb{R}^3$ .

Estimate  $f(3.1, 4.2, 11.7)$  by  $A(3.1, 4.2, 11.7)$  and calculate the error.

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f:=sqrt(x^2+y^2+z^2);
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```
A:=f+diff(f,x)*dx+diff(f,y)*dy+diff(f,z)*dz;
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```
eq0:=x=3,y=4,z=11;
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```
eq1:=x=3.1,y=4.2,z=11.7;
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```
deq:=dx=.1,dy=.2,dz=.7;
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```
subs(eq1,f)-subs(eq0,deq,A);
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```
evalf(%);
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