CALCULUS

Linear approximation

NEW

0540-1. Find the linearization of

NEW

$$f(x) = 2x^3 + 8x$$

at $x = 4$.

That is, find m and a s.t. the linear function

$$L(x) = a + m(x - 4)$$

has the same 1-jet at $x = 4$ as does $f(x)$.

That is, find m and a s.t. the linear function

$$L(x) = a + m(x - 4)$$

satisfies: $L(4) = f(4)$ and $L'(4) = f'(4)$.

0540-2. Find the linearization of
NEW

$$f(x) = \sin^2 x$$

at $x = \pi/3$.

That is, find m and a s.t. the linear function

$$L(x) = a + m(x - (\pi/3))$$

has the same 1-jet at $x = \pi/3$ as does $f(x)$.

That is, find m and a s.t. the linear function

$$L(x) = a + m(x - (\pi/3))$$

satisfies: $$L(\pi/3) = f(\pi/3)$$

and $L'(\pi/3) = f'(\pi/3)$.

0540-3. Let $y = \dfrac{x^2 \tan x}{3^x}$.
NEW

Compute $\triangle y$ and dy.

0540-4. Let $q = \dfrac{v - e^2}{\tan(v+1)}$.
NEW

Compute $\triangle q$ and dq.

0540-5. Let $z = \dfrac{e^{3t^3 - \pi t}}{\sec(2t)}$.
NEW

a. Compute $[\triangle z]_{t:\to 0, \triangle t:\to 0.0002}$.

b. Compute $[dz]_{t:\to 0, dt:\to 0.0002}$.

0540-6. a. Compute $(2.999)^7$.
NEW

b. Approx. $(2.999)^7$ by differentials.

c. Let $L(x)$ be the linearization of $f(x) = x^7$ at $x = 3$.

Compute $L(2.999)$.

0540-7. Let θ be the number of radians in $45.2°$.
NEW

Approximate $\sec^2 \theta$ by differentials.

0540-8. Approx. $\cos(0.0003)$ by differentials.
NEW

0540-9. We need to paint a cube whose side length is 5 meters.

NEW

The coat of paint is to be 0.003 meters thick, so, after painting, the sides will have length 5.006 meters.

a. Let $V = s^3$. Compute $\triangle V$ and dV.

b. Using $\triangle V$, compute the exact volume of paint that will be needed.

c. Using dV, estimate the volume of paint that will be needed.

d. Compute 0.003 times the surface area of a cube of side length 5 meters.

0540-10. The Borg collective seeks to design a cube that measures 2000 ± 1 meters on a side.
NEW

Up to some error, its volume will be 2000^3 cubic meters.

Using differentials, estimate that error.