Example:

A tofurkey is cooking in the oven, and Ms. Mackey is measuring its temperature at regular intervals. As she puts the tofurkey in the oven, its temperature is 50°. After the first hour of cooking, its temperature is 93°. After 2 hours of cooking, its temperature is 129°. Predict what the temperature could be after three hours of cooking.

1. The tofurkey in the example is removed from the oven when its temperature reaches 185°F and is placed on a table in a room where the temperature is 75°F. After 10 minutes the temperature of the tofurkey is 172° and after 20 minutes it is 160°F. Use a linear approximation to predict the temperature of the tofurkey after half an hour. Do you think your prediction is an overestimate or an underestimate? Why?
2. Atmospheric pressure P decreases as altitude h increases. At a temperature of 15°C, the pressure is 101.3 kilopascals (kPa) at sea level, 87.1 kPa at h = 1 km, and 74.9 kPa at h = 2 km. Use linear approximation to estimate the atmospheric pressure at an altitude of 3 km.
3. The table shows the population of Nepal in millions as of June 30 given year. Use a linear approximation to estimate the population at midyear in 1984. Use another linear approximation to predict the population in 2006.

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| --- | --- | --- | --- | --- | --- |
| t | 1980 | 1985 | 1990 | 1995 | 2000 |
| N(t) | 15.0 | 17.0 | 19.3 | 22.0 | 24.9 |

Find the linearization L(x) of the function at a.

1. $f\left(x\right)=x^{3}$, a = 1
2. $f\left(x\right)=1/\sqrt{2+x}$ , a = 0
3. $f\left(x\right)=\cos(x)$, a = π/2
4. $f\left(x\right)=\sqrt[3]{x}$, a = -8
5. Find the linearization approximation of the function $f\left(x\right)=\sqrt{1-x}$ at a = 0 and use it to approximate the numbers $\sqrt{0.9}$ and $\sqrt{0.99}$.
6. Find the linearization approximation of the function $f\left(x\right)=\sqrt[3]{1+x}$ at a = 0 and use it to approximate the numbers $\sqrt[3]{0.95}$ and $\sqrt[3]{1.1}$.