

MAT125 Homework for Lectures 16-17

July 5, 2021

1 Problems

1. Find an approximate value of $\sqrt{25.2}$ using the method from class. Compare this with what the calculator gives you.
2. Find an approximate value of $(3.1)^4$ using the method from class. Compare this with what the calculator gives you.
3. Find an approximate value of $\sin 29^\circ$ using the method from class. Compare this with what the calculator gives you.
4. What is the differential for the volume of a sphere when the radius changes from 2 cm to 2.01 cm?
5. The sides of a cube are growing at 3 cm/s. What is the rate of change of the surface area when the volume of the cube is 729 cm^3 ?

2 Answer Key

1. 5.02

2. 91.8

3. $\frac{1}{2} - \frac{\pi\sqrt{3}}{360}$

4. $dV = 0.64\pi\text{cm}^3$

5. $\frac{dA}{dt} = 324\text{cm}^2/s$

3 Solution

1. $f'(x) \approx \frac{f(x+h)-f(x)}{h}$ so $f(x+h) \approx f(x) + hf'(x)$. In this case, let $f(x) = \sqrt{x}$ and we'll plug in $x = 25, h = 0.2$. So $\sqrt{25.2} \approx \sqrt{25} + 0.2 * \frac{1}{2\sqrt{25}} = 5.02$.
2. Like before, use $f(x+h) \approx f(x) + hf'(x)$ with $x = 3, h = 0.1$. We get $(3.1)^4 \approx 3^4 + 0.1 * 4(3)^3 = 81 + 10.8 = 91.8$.
3. Let $x = \pi/6$ and $h = -\frac{\pi}{180}$. Then $\sin 29^\circ \approx \sin(\pi/6) - \frac{\pi}{180} * \cos(\pi/6) = \frac{1}{2} - \frac{\pi\sqrt{3}}{360}$.
4. $V = \frac{4}{3}\pi r^3$ and so $dV = 4\pi r^2 dr$. Plug in $r = 4, dr = 0.01$ and we get $dV = 0.64\pi \text{cm}^3$.
5. The surface area of a cube is $A = 6x^2$ where x is the length of a side. So $\frac{dA}{dt} = 12x \frac{dx}{dt}$. We're interested in when the side length is $729^{1/3} = 9$ cm. So $\frac{dA}{dt} = 324 \text{cm}^2/\text{s}$.