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= Year 12 **= Calculus** **= Worksheet 7**

1. Use $f(a+h) \approx f(a) + hf'(a)$ to estimate $f(1.01)$ given $f(x) = x^4 - 5x^3$.

2. Use $f(a+h) \approx f(a) + hf'(a)$ to estimate $f(24.5)$ and $f(25.5)$ given $f(x) = \sqrt{x}$.

3. Use $f(a+h) \approx f(a) + hf'(a)$ to estimate $f(2.745)$, given $f(x) = \log_e x$ and $e \approx 2.718$.

4. Given $x = 3.0$ is an approximate solution to the equation $x^3 - 3x^2 + x - 2 = 0$, use $f(a+h) \approx f(a) + hf'(a)$ to find a better approximation of the solution.

5. Given $y = \sqrt[3]{x}$, use $\Delta y \approx \dfrac{dy}{dx}\Delta x$ to find the % change in y when x changes from 125 to 126.

6. Given $y = e^x$, use $\Delta y \approx \dfrac{dy}{dx}\Delta x$ to find the % change in y when x increases by 0.01.

7. Use 'left' rectangles of unit width to estimate the area under the graph of $y = e^x$ between $x = 0$ and $x = 3$.

8. Use 'right' rectangles of unit width to estimate the area under the graph of $y = e^x$ between $x = 0$ and $x = 3$. Find the average of the left and right-rectangles estimates.

9. Use 'left' rectangles of $\dfrac{\pi}{6}$ in width to estimate the area under the graph of $y = \sin x$ between $x = 0$ and $x = \dfrac{\pi}{2}$.

10. Use 'right' rectangles of $\dfrac{\pi}{6}$ in width to estimate the area under the graph of $y = \sin x$ between $x = 0$ and $x = \dfrac{\pi}{2}$. Find the average of the left and right-rectangles estimates.

11. Use 'right' rectangles of 10 units in width to estimate the area bounded by the curve $y = \dfrac{1}{10}\log_{10} x$, the x-axis and the line $x = 20$.

Numerical, algebraic and worded answers.

1. -4.11
2. 4.95, 5.05
3. 1.010
4. 2.9
5. 0.27%
6. 1%
7. $1+e+e^2$ sq units
8. $e+e^2+e^3$ sq units
   $(1+2e+2e^2+e^3)/2$ sq units
9. $(1+\sqrt{3})\pi/12$ sq units
10. $(3+\sqrt{3})\pi/12$ sq units
    $(2+\sqrt{3})\pi/12$ sq units
11. 2.3 sq units