SECTION 3.2

3.2.1 Use the definition of the derivative to calculate $f'(x)$ if $f(x) = 3x^2 - x$ and find the equation of the tangent to the graph of f at $x = 1$.

3.2.2 Use the definition of the derivative to calculate $f'(x)$ if $f(x) = 2x^2 - x + 1$.

3.2.3 Use the definition of the derivative to calculate $f'(x)$ if $f(x) = 2x^3 + 1$ and find the equation of the tangent line and the normal line to the graph of f at $x = 1$.

3.2.4 Use the definition of the derivative to calculate $f'(x)$ if $f(x) = x^3 - 3x$ and find the equation of the tangent line and the normal line to the graph of f at $x = 2$.

3.2.5 Use the definition of the derivative to calculate $f'(x)$ if $f(x) = \sqrt{2x}$ and find the equation of the tangent line and the normal line to the graph of f at $x = 2$.

3.2.6 Let $y = \sqrt{3x+1}$. Use the definition of the derivative to find $\dfrac{dy}{dx}$.

3.2.7 Let $y = \dfrac{1}{x+2}$. Use the definition of the derivative to find $\dfrac{dy}{dx}$.

3.2.8 Use the definition of the derivative to calculate $f'(x)$ if $f(x) = \dfrac{2}{3-x}$.

3.2.9 Given that $f(0) = 4$ and $f'(0) = -1$, find an equation for the tangent line to the graph of $y = f(x)$ at the point where $x = 0$.

3.2.10 Given that $f(2) = -1$ and $f'(2) = 5$, find an equation for the tangent line to the graph of $y = f(x)$ at the point where $x = 2$.

3.2.11 Use the definition of the derivative to calculate $f'(x)$ if $f(x) = \dfrac{1}{\sqrt{2x}}$ and find the equation of the tangent line and the normal the line to the graph of f at $x = 2$.

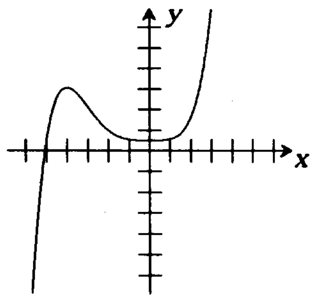
3.2.12 The volume of a sphere is given by $\frac{4}{3}\pi r^3$ where r is the radius of the sphere. Use the method of Section 3.2 to find the instantaneous rate of change of V with respect to r when $r = 4$.

3.2.13 The surface area of a sphere is given by $S = 4\pi r^2$ where r is the radius of the sphere. Use the method of Section 3.2 to find the instantaneous rate of change of S with respect to r when $r = 4$.

3.2.14 The volume of a sphere is given by $V = \frac{\pi}{6}D^3$ where D is the diameter of the sphere. Use the method of Section 3.2 to find the instantaneous rate of change of V with respect to D when $D = 2$.

3.2.15 Show that $f(x) = \begin{cases} x^2 - 5 & x \leq 1 \\ x - 5 & x > 1 \end{cases}$ is continuous but not differentiable at $x = 1$. Sketch the graph of f.

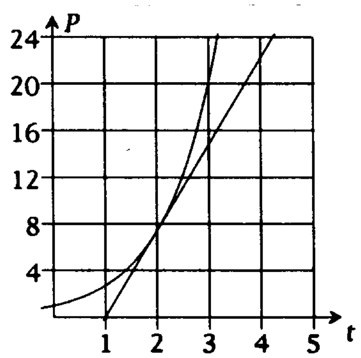
3.2.16 Sketch the graph of the derivative of the function whose graph is shown.



3.2.17 It has been observed that some large colonies of bacteria tend to grow at a rate proportional to the number of bacteria present. The graph shows bacteria count P (in thousands) versus time t (in seconds)

(a) Estimate P and $\frac{dP}{dt}$ when $t = 2$ sec

(b) This model for bacterial growth can be expressed as $\frac{dP}{dt} = kP$ where k is the constant of proportionality. Use the results in part (a) to estimate the value of k.



3.2.18 Use a graphing utility to show that $y = \sqrt[6]{x^2}$ does not have a derivative at $x = 0$.

3.2.19 Use a graphing utility to show that $y = x - 2$ does not have a derivative everywhere.