KEY

Derivatives, Rates of Change, and Equations of Lines

1) Find the slope of y = (x + 1)(x + 2) at x = -3. -3

2) Find the equation of the tangent line in problem #1 at the point (-3, 10). $y-10=-3(x+3)$

3) Find the slope of the secant line (average rate of change) over the interval [1,4] of $y=\frac{1}{\sqrt{x}}$. $-\frac{1}{6}$

4) Find the instantaneous rate of change in problem #3 at x = 4. $-\frac{1}{16}$

5) Determine the x-value of the point in the interval $[0,2\pi)$ where the function $y=x+\cos x$ has a horizontal tangent line. $\pi/2$

6) Determine the equation of the vertical tangent line of $y=2x+3\sqrt{x}$. $x=0$

7) Find the equation of the normal line (perpendicular to the tangent line) of $y=3x^2-4x$ at x = 2. $y-4=-\frac{1}{8}(x-2)$

1) $y=x^2+3x+2$

$y'=2x+3$

$f'(-3)=2(-3)+3$

$f'(-3)=-3$

2) $y-10=-3(x+3)$

3) $y=\frac{1}{\sqrt{x}}$

$\frac{f(4)-f(1)}{4-1}$

$\frac{\frac{1}{2}-1}{3}=-\frac{1}{2}\cdot\frac{1}{3}=-\frac{1}{6}$

4) $y=x^{-1/2}$

$y'=-\frac{1}{2}x^{-3/2}$

$y'=-\frac{1}{2(\sqrt{x})^3}$

$f'(4)=-\frac{1}{2}(4)^{-3/2}$

$f'(4)=\frac{-1}{2\cdot 4^{3/2}}$

$=\frac{-1}{2\cdot(\sqrt{4})^3}$

$=-\frac{1}{16}$

5) $y=x+\cos x$

$y'=1-\sin x$

$0=1-\sin x$

$-1=-\sin x$

$1=\sin x$

$x=\frac{\pi}{2}$

6) $y=2x+3x^{1/2}$

$y'=2+\frac{3}{2}x^{-1/2}$

$y'=2+\frac{3}{2\sqrt{x}}$

$2\sqrt{x}=0$

$x=0$

7) $y'=6x-4$

$f'(2)=8$ $(2,4)$

$y-4=-\frac{1}{8}(x-2)$