Homework

1. Calculate the average rate of change of $f(x) = x^2 - 1$ over the interval [1, 4].

(a) 8 (b) 6 (c) 5 (d) 12 (e) 4

$$\frac{f(4)-f(1)}{4-1} = \frac{15-0}{3} = 5$$

2. Given $f(x) = x^3 + 4, determine\ f'(5)$ ___/4

a. 379 b. 129 c. 0 d. 79 $\boxed{\text{e.75}}$

$f'(x) = 3x^2$

$f'(5) = 3(25) = 75$

1. $f(x) = \begin{cases} 3x^2 + 4x + 4, x < 1 \\ 2x^3 + bx + c, x \geq 1 \end{cases}$

If f(x) is continuous and differentiable at x=1, then what are the values of a and b?

Continuity:

$3x^2+4x+4 = 2x^3+bx+c$ at $x=1$

$3+4+4 = 2+b+c$

$11 = 2+b+c$

$9 = b+c$ $\boxed{c=5}$

Differentiability:

$6x+4 = 6x^2+b$ at $x=1$

$6+4 = 6+b$

$\boxed{4=b}$

3. If $f(x) = 8\sqrt[4]{x}, f'(16) =$

$f(x) = 8 \cdot x^{1/4}$

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

$f'(x) = \frac{2}{\sqrt[4]{x^3}}$

$f'(16) = \frac{2}{\sqrt[4]{16^3}} = \frac{2}{2^3} = \boxed{\frac{1}{4}}$

4. If $f(x) = x^2 + \sqrt{x} + \frac{1}{x}$, then the slope of the curve f(x) at x= 1 is

$f(x) = x^2 + x^{1/2} + x^{-1}$

$f'(x) = 2x + \frac{1}{2}x^{-1/2} - x^{-2}$

$f'(1) = 2 + \frac{1}{2} - 1 = \boxed{\frac{3}{2}}$

5. Write the equation to the tangent and normal of $f(x) = x^3 - 2x - 1$ at x=2.

Point: $f(2)=8-4-1=3 \rightarrow (2,3)$

Slope: $f'(x)=3x^2-2$

$f'(2)=10$

T: $y-3=10(x-2)$

N: $y-3=\frac{-1}{10}(x-2)$

6. Write the equation to the tangent and normal of $f(x) = x^2 - 2\sqrt{x} - 1$ at x=1.

Point: $f(1)=1^2-2\sqrt{1}-1=1-2-1=-2 \rightarrow (1,-2)$

Slope: $f'(x)=2x-x^{-1/2}$

$f(x)=x^2-2x^{1/2}-1$

$f'(1)=2(1)-(1)^{-1/2}=2-1=1$

T: $y+2=1(x-1)$

N: $y+2=-1(x-1)$

HW: Pg. 116 #1-10, #31-35 odd, 36, 39
Pg. 151 #57-58, 63