The Weekly Rigor

No. 226 "A mathematician is a machine for turning coffee into theorems." October 20, 2018

20 Problems in Calculating Type 3 Difference Quotients

(Part 1)

$$\frac{f(x+\Delta x)-f(x)}{\Delta x}$$

PROBLEMS

1. $f(x)=x$

2. $f(x)=x^2$

3. $f(x)=x^3$

4. $f(x)=2x^3$

5. $f(x)=2x^2+5$

6. $-5x^2+3x$

7. $f(x)=x^3-2x^2+3$

8. $f(x)=3x^2-5x+4$

9. $f(x)=mx+b$

10. $f(x)=ax^2+bx+c$

11. $f(x)=\frac{1}{x}$

12. $f(x)=\frac{1}{x+2}$

13. $f(x)=\frac{7}{x+2}$

14. $f(x)=\frac{7}{5x+2}$

15. $f(x) = \sqrt{x}$

16. $f(x) = \sqrt{x-3}$

17. $f(x) = \sqrt{x^2+1}$

18. $f(x) = \sqrt{3x^2+x}$

19. $f(x) = \frac{1}{\sqrt{x}}$

20. $f(x) = \frac{1}{\sqrt{x+2}}$

ANSWERS

1. 1	2. $2x + \Delta x$
3. $3x^2 + 3x\Delta x + (\Delta x)^2$	4. $6x^2 + 6x\Delta x + 2(\Delta x)^2$
5. $4x + 2\Delta x$	6. $-10x - 5\Delta x + 3$
7. $3x^2 + 3x\Delta x + (\Delta x)^2 - 4x - 2h$	8. $6x + 3\Delta x - 5$
9. m	10. $2ax + a\Delta x + b$
11. $\frac{-1}{x(x+\Delta x)}$	12. $\frac{-1}{(x+2)(x+\Delta x+2)}$
13. $\frac{-7}{(x+2)(x+\Delta x+2)}$	14. $\frac{-7}{(5x+2)(5(x+\Delta x)+2)}$
15. $\frac{1}{\sqrt{x+\Delta x}+\sqrt{x}}$	16. $\frac{1}{\sqrt{x+\Delta x-3}+\sqrt{x-3}}$
17. $\frac{2x+\Delta x}{\sqrt{(x+\Delta x)^2+1}+\sqrt{x^2+1}}$	18. $\frac{6x+3\Delta x+1}{\sqrt{3(x+\Delta x)^2+(x+\Delta x)}-\sqrt{3x^2+x}}$
19. $\frac{-1}{\sqrt{x}\sqrt{x+\Delta x}(\sqrt{x}+\sqrt{x+\Delta x})}$	20. $\frac{-1}{\sqrt{x+2}\sqrt{x+\Delta x+2}(\sqrt{x+2}+\sqrt{x+\Delta x+2})}$