The Weekly Rigor

No. 223 "A mathematician is a machine for turning coffee into theorems." September 29, 2018

20 Problems in Calculating Type 2 Difference Quotients

(Part 1)

$$\frac{f(a+h)-f(a)}{h}$$

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. $f(x)=px^2+qx+r$

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