Problems for Gateway #2: Difference Quotients

1. Consider the function f defined by the equation:

$$f(x) = x^2 + 1.$$

The difference quotient of f is:

(a) $\dfrac{x^2+1+h-x^2+1}{h}$ **(b)** $\dfrac{(x+h)^2-x^2}{h}$

(c) $\dfrac{(x+h)^2+1-x^2+1}{h}$ **(d)** $\dfrac{x^2+1+h-x^2-1}{h}$

(e) $\dfrac{(x+h)^2+1}{x^2+1}$

2. Consider the function f defined by the equation:

$$f(x) = 1.$$

The difference quotient of f is:

(a) $\dfrac{1+h-1}{h}$ **(b)** $\dfrac{1+h}{1-h}$

(c) 1 **(d)** 0

(e) $\dfrac{x+h-1}{h}$

3. Consider the function f defined by the equation:

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

The difference quotient of f is:

(a) $\dfrac{3^{x+h}-3^x}{h}$ **(b)** $\dfrac{3^x+h-3^x}{h}$

(c) $\dfrac{3^{x+h-x}}{h}$ **(d)** $\dfrac{3^{x+h}}{3^x}$

(e) $\dfrac{3^h-3^x}{h}$

4. Consider the function f defined by the equation:

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

The difference quotient of f is:

(a) $\dfrac{3x^2 + h - 3x^2}{h}$ **(b)** $\dfrac{3x^2 + 3h - 3x^2}{h}$

(c) $\dfrac{3x^2 + 3h^2 - 3x^2}{h}$ **(d)** $\dfrac{(3x + h)^2 - 3x^2}{h}$

(e) $\dfrac{3(x + h)^2 - 3x^2}{h}$

5. Consider the function f defined by the equation:

$$f(x) = x + 4.$$

The difference quotient of f is:

(a) 0 **(b)** $\dfrac{1}{h}$

(c) 1 **(d)** $\dfrac{x + 4 + h - x + 4}{h}$

(e) 4

6. Consider the function f defined by the equation:

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

The difference quotient of f is:

(a) $\dfrac{\frac{1}{x} + h - \frac{1}{x}}{h}$ **(b)** $\dfrac{\frac{1}{x} + \frac{1}{h} - \frac{1}{x}}{h}$

(c) $\dfrac{\frac{1}{x+h} - \frac{1}{x}}{h}$ **(d)** $\dfrac{\frac{1}{x+h} - \frac{1}{x}}{\frac{1}{h}}$

(e) $\dfrac{\frac{h}{x} - \frac{1}{x}}{h}$

7. Consider the function f defined by the equation:

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

The difference quotient of f is:

(a) $\dfrac{2^h}{h}$ **(b)** $\dfrac{2^{x+h} - 2^x}{h}$

(c) $\dfrac{2^{x+h} + h - 2^{x+h}}{h}$ **(d)** $\dfrac{2^x}{2^h}$

(e) $\dfrac{2^x + h - 2^x}{h}$

8. Consider the function f defined by the equation:

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

The difference quotient of f is:

(a) $\dfrac{x + h - x}{x + h - x}$ **(b)** $\dfrac{x + \frac{1}{x+h} - x + \frac{1}{x}}{h}$

(c) $\dfrac{x + h + \frac{1}{x} - x + \frac{1}{x}}{h}$ **(d)** $\dfrac{x + h + \frac{1}{x+h} - x - \frac{1}{x}}{h}$

(e) $\dfrac{\frac{1}{x+h} - x}{h}$

9. Consider the function f defined by the equation:

$$f(x) = x^{10}.$$

The difference quotient of f is:

(a) $10x^9$ **(b)** $\dfrac{x^{10} + h^{10} - x^{10}}{h}$

(c) $\dfrac{x^{10} + h - x^{10}}{h}$ **(d)** $\dfrac{10x^9 + h - x^{10}}{h}$

(e) $\dfrac{(x+h)^{10} - x^{10}}{h}$

10. Consider the function *f* defined by the equation:

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

The difference quotient of *f* is:

(a) 0

(b) $\frac{2^{4+h} - 2^4}{h}$

(c) 2

(d) 4

(e) $4*2^3$

ANSWERS:

1.	B	**2.**	D	**3.**	A	**4.**	E
5.	C	**6.**	C	**7.**	B	**8.**	D
9.	E	**10.**	A				