Precalculus Unit 1 worksheet: The difference quotient

Name _____ Date _____ Period _____

1. Find and simplify the difference quotient $\dfrac{f(x+h)-f(x)}{h}$ of each function.

(a) $f(x)=\dfrac{x^2-6x}{4}$

(b) $f(x)=5x-2x^2$

(c) $f(x)=(2x+1)(x-3)$

(d) $f(x)=x^2(x-3)$

2. Let $f(x)=-2x^2+4x-5$. Find and simplify the difference quotient of f. Use it to find the slope of the secant line through the points of the graph at $x=-1$ and $x=1$, then write an equation of that secant line in slope-intercept form.

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3. Diego drains a hot tub. The volume of water left t minutes after the drain opens is $V(t) = 2t^2 - 100t + 1{,}250$ liters, for $0 \le t \le 25$.

(a) Find and simplify $\dfrac{V(t+h) - V(t)}{h}$, and give its units.

(b) Use it to find the average rate of change of the volume over the first 10 minutes.

(c) During which 2-minute stretch does the water drain at an average of 60 liters per minute?

4. Let $f(x) = \sqrt{9 - 2x}$.

(a) Find and simplify the difference quotient of f, and say which values of x and $x + h$ it needs.

(b) Use it to find the average rate of change of f on $[-8, 0]$. Check your answer from $f(-8)$ and $f(0)$.

5. Find and simplify the difference quotient of $f(x) = \dfrac{1}{x^2}$, and say which values of x and $x + h$ it needs. Check your answer with $x = 1$ and $h = 1$.

6. Let $f(x) = \dfrac{6}{x}$.

(a) Find and simplify the difference quotient of f.

(b) Explain why every secant line joining two points on the same branch of the graph has a negative slope.

(c) Evaluate your quotient at $x = -2$ and $h = 5$. Check the number from $f(-2)$ and $f(3)$, then explain why it does not describe how the graph behaves between $x = -2$ and $x = 3$.

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