KEY AP Precalculus – Mixed Six – Unit 1 Review Calculator

Three functions *f*, *g*, and *h* are introduced in #1, #2, and #3. Use these functions for #4, #5, and #6. Round your answers to three places after the decimal.

1. Factual Recall

The polynomial function *f* is given by

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

Find each of the following:

a) the zeros of *f*

$x = -1, 0, 2$

b) the value of the function when $x = 2.5$

$f(2.5) = 4.375$

c) The value of *x* when $f(x) = 2.5$

$x = 2.324$

d) Determine the end behavior of *f* and express your answer as a limit.

$\lim_{x\to-\infty} f(x) = -\infty$; $\lim_{x\to\infty} f(x) = \infty$

2. Carry out a Procedure

x	–2	–1	0	1	2
$g(x)$	–8	–5	2	7	10

Let *g* be an increasing function defined for all real numbers. The table above gives values of *g* for selected values of *x*.

a) Use the table of values of $g(x)$ to determine a linear model.

$\hat{y} = 1.2 + 4.8x$

b) Use your model to approximate a value for $g(0.5)$.

$g(0.5) \approx 3.6$

3. Classify a Mathematical Object

True-False

The rational function *h* is given by

$$h(x) = \frac{x^3 + 4x^2 - 3}{x^2 - 1}.$$

T/F	Statement
F	$\lim_{x\to\infty} h(x) = -\infty$
T	$\lim_{x\to-\infty} h(x) = -\infty$
F	The graph of *h* has two vertical asymptotes.
T	The graph of *h* has a hole and one vertical asymptote.

$h(x) = \frac{(x+1)(x^2+3x-3)}{(x+1)(x-1)}$, hole at $x = -1$, VA $x = 1$

4. Prove, Show, Justify

The rational function *h* has a slant asymptote. Find the slant asymptote. Show the work that leads to your answer. Graph the function and the slant asymptote on your calculator to verify.

$h(x) = x + 4 + \frac{x+1}{x^2-1}$ *or* $x + 4 + \frac{1}{x-1}$

$S.A.: y = x + 4$

See division and graph on page 2

5. Extend a Concept

For the polynomial function *f* and the rational function *h* find the points of intersection.

(0.850, –1.808) and (2.721, 7.302)

For what values *x* are the values of both the polynomial function *f* and the function *g* less than –8? That is, find the values of *x* that satisfy $f(x) < -8$ and $g(x) < -8$.

$f(x) < -8$ when $x < -2$

$g(x) < -8$ when $x < -2$

$\boxed{x < -2}$

6. Critique a Fallacy

Suppose *j* is a new function defined by $j(x) = \frac{f(x)}{x+1}$. Sam says that *j* will have a vertical asymptote of $x = -1$. Is Sam correct? If not, please correct his response.

Sam is not correct. The function *j* has a hole at $x = -1$.

$$j(x) = \frac{x(x-2)(x+1)}{x+1} = x(x-2)$$

when $x \neq -1$.

The hole has coordinates of (–1, 3).

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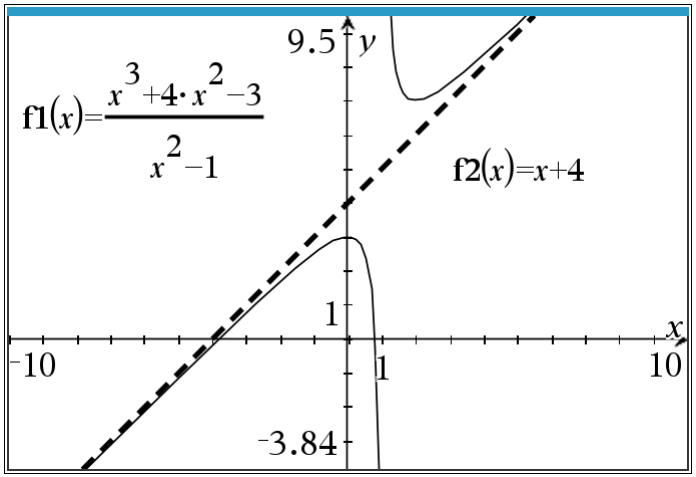
#4

$$
\begin{array}{r}
x+4 \\
x^2-1\,\overline{)\,x^3+4x^2+0x-3} \\
\underline{x^3 \qquad -x} \\
4x^2+x-3 \\
\underline{4x^2 \qquad -4} \\
x\ +1
\end{array}
\qquad\qquad
\begin{array}{r}
x+4 \\
x-1\,\overline{)\,x^2+3x-3} \\
\underline{x^2-x} \\
4x-3 \\
\underline{4x-4} \\
1
\end{array}
$$



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