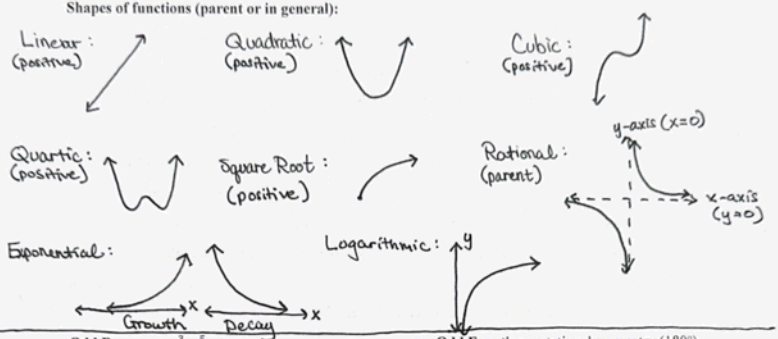
AP Precalculus Things to Memorize by Unit (roughly)
You can use this to help you come up with your "Brain Dump" assignments

Unit 1: Polynomial and Rational Functions & Unit 2: Exponential and Logarithmic Functions

Shapes of functions (parent or in general):



Odd Degree: x, x^3, x^5, etc.

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

vs. Odd Function: rotational symmetry (180°)

Rule: $f(-x) = -f(x)$

$f(-3) = 6$
$f(3) = -6$

Even Degree: x^2, x^4, x^6

$g(x) = x^2 + 2x - 4$

vs. Even Function: y-axis symmetry

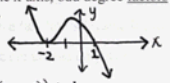
Rule: $f(-x) = f(x)$

$f(-3) = 6$
$f(3) = 6$

Multiplicity: even degree factors bounce off the x-axis, odd degree factors go through the x-axis

Example: $f(x) = (x-1)(x+2)^2$

$x - 1 = 0 \quad | \quad x + 2 = 0$
$x = 1 \quad | \quad x = -2$



Transformations (ALL functions, f): $af(b(x-c)) + d$

- Vertical dilation by a factor of $|a|$. If $a < 0$, then there is a reflection over the x-axis (vertical).
- Horizontal dilation by a factor of $\left|\frac{1}{b}\right|$. If $b < 0$, then there is a reflection over the y-axis (horizontal).
- Horizontal translation c units. $(x-3)$ shifts right 3 units and $(x+3)$ shifts left 3 units
- Vertical translation d units.

Rates of Change:

$f(x)$ is increasing at an increasing rate = the graph is rising and concave up

$f(x)$ is increasing at a decreasing rate = the graph is rising and concave down

$f(x)$ is decreasing at an increasing rate = the graph is falling and concave up

$f(x)$ is decreasing at a decreasing rate = the graph is falling and concave down

AP Precalculus Things to Memorize by Unit (roughly)
You can use this to help you come up with your "Brain Dump" assignments

Rational Functions (how to find features):

Horizontal Asymptotes: Use the 3 rules about the degrees of the numerator and denominator

Degree of numerator < Degree of denominator: HA is $y = 0$

Degree of numerator = Degree of denominator: HA is $y =$ the leading coefficients

Degree of numerator > Degree of denominator: HA is undefined (may have a slant asymptote)

Vertical Asymptotes and Holes:

Factor the function.

Set the denominator = 0 and solve.

If the factor appears in the numerator and denominator, there is a hole. (removable discontinuity)

If the factor only appears in the denominator, there is a VA. (non-removable discontinuity)

Intercepts:

x-intercept $(a, 0)$: Set numerator = 0 (after "canceling"/removing factors).

y-intercept $(0, b)$: Substitute in $x = 0$.

Inverse functions:

Notation for inverse: $f^{-1}(a) = b \rightarrow f(b) = a$

Example: $f^{-1}(2)$, then $f(x) = 2$

The x and y values swap, so the domain and range swap.

Invertible function (one-to-one) – when a function's inverse is also a function.

There are unique outputs for every unique input.

Composite functions:

Notation for composite: $(f \circ g)(x) = f(g(x))$

Example: For $f(g(2))$ and $g(2) = -1$, then $f(-1) = f(g(2))$

You are substituting one function/function's output into another.

Know your Exponent rules and Logarithmic rules: Examples below

$6^{2x+1} = (6^2)^x \cdot 6^1 = (36)^x \cdot 6 = 6 \cdot (36)^x$ and $\log_b b = 1,\ \log_b 1 = 0$

$3^{-1} = \frac{1}{3}$, and $25^{(1/2)} = \sqrt{25} = 5$ and $\log_3 x + 2\log_3 y - \log_3 z = \log_3\left(\frac{xy^2}{z}\right)$

Solving: Either find alike bases or isolate and rewrite

$4^{3x} = 8^{1-2x}$ and $\log_2(x+2)\, x = 3$

$2^{2(3x)} = 2^{3(1-2x)}$ and $2^3 = x^2 + 2x$ ***you have to know how to factor**

AP Precalculus Things to Memorize by Unit (roughly)
You can use this to help you come up with your "Brain Dump" assignments

Free Response Question reminders

Justifying models for FRQ #1:

Question B (possibly)

Linear:

The input values change at a constant rate. The output values change at a constant rate.

OR The input values change additively. The output values change additively.

Exponential:

The input values change at a constant rate. The output values change proportionally.

OR The input values change at a additively. The output values change multiplicatively.

Logarithmic:

The input values change proportionally. The output values change at a constant rate.

OR The input values change multiplicatively. The output values change additively.

Quadratic:

The input values change at a constant rate. The output values change at a constant 2nd difference.

Cubic:

The input values change at a constant rate. The output values change at a constant 3rd difference.

Limit notation:

Question B (possibly): $\lim_{x \to -\infty} f(x) = \infty$ (left end behavior), $\lim_{x \to \infty} f(x) = \infty$ (right end behavior)

Justifying if a function is invertible:

Question C (possibly):

The function does not have an inverse because the output values for not unique to each input value.

For example, $f(3) = 2$ and $f(7) = 2$ *This would be found on a table or graph given in the problem.

FRQ #2:

For question A(i) write two or three equations using the two points provided $(x_1, y_1), (x_2, y_2)$ with the model equation provided. $f(x_1) = y_1$ and $f(x_2) = y_2$

For question A(ii) use the calculator to solve for constants a and b (possibly c).

For question B(i) "Average Rate of Change" means to use the slope formula:

For question B(iii) you need to talk about how the linear model you found is "**secant**" to the given model in question A.