

- 1 (6 points) Let $\phi(t) = \frac{4t+5}{11-3t}$. Find a formula for $\phi^{-1}(t)$.

$$\phi^{-1}(t) = \frac{11t-5}{3t+4}.$$

- 2 (6 points) Let $f(x) = |x^2 - 4|$ and $g(x) = 2(x+5)$. Write out the multipart rule for the composition $f(g(x))$.

$$f(g(x)) = \begin{cases} [2(x+5)]^2 - 4 & \text{if } x < -6; \\ 4 - [2(x+5)]^2 & \text{if } -6 \leq x \leq -4; \\ [2(x+5)]^2 - 4 & \text{if } x > -4. \end{cases}$$

- 3 (13 points) Clovis is deciding how much to charge for his self-published novel. The number of copies he sells is a linear function of the amount that he charges.

If he charges \$15 per copy, he'll sell 350 copies.

If he charges \$30 per copy, he'll sell 230 copies.

- (a) (6 points) Find a function $f(x)$ for the **total amount of money** Clovis earns by charging \$ x per copy.

$$f(x) = -8x^2 + 470x.$$

- (b) (7 points) How much should he charge in order to **maximize** his revenue?

Clovis should charge \$29.375 for a copy of his book.

- 4 (13 points) The population of Hawai'i was 1 million in 1980. It rose to 1.4 million in 2012. The population of Alaska was 0.5 million in 1984. It grew to 0.7 million in 2009.

- (a) (4 points) Compute an exponential function that models the population of Hawai'i. Take $t = 0$ in 1980.

$$H(t) = (1.01057)^t.$$

- (b) (4 points) Compute an exponential function that models the population of Alaska. Take $t = 0$ in 1980.

$$A(t) = 0.4738 \cdot (1.01355)^t.$$

- (c) (5 points) In what year will Hawai'i have twice as many people as Alaska?

The year is 1998.

- 5 (12 points) Find the linear-to-linear function whose graph passes through the points $(0, 1)$, $(1, 5)$ and $(2, 7)$. What is its horizontal asymptote?

The function is $f(x) = \frac{13x+2}{x+2}$.

The horizontal asymptote is the line $y = 13$.