

**Problem 1 (4 points):** Solve for  $x$  if  $x^{18} - 2 = 216$ . Express your answer both as an exact quantity and as a decimal rounded to four decimal places.

**Solution:** In order to solve for  $x$ , we add 2 to both sides, obtaining

$$x^{18} = 218.$$

We then raise both sides to the power  $1/18$ , obtaining

$$(x^{18})^{1/18} = (218)^{1/18}.$$

Simplifying the left hand side, we find

$$x = \pm (218)^{1/18} \approx \pm 1.3487,$$

having used a calculator to find the decimal approximation.

**Problem 2 (4 points):** [GH 3.1.24] Solve for  $z$  if  $1 + 7^{9z} = 6$ . Express your answer both as an exact quantity and as a decimal rounded to four decimal places.

**Solution:** In order to solve for  $z$ , we subtract 1 from both sides, obtaining

$$7^{9z} = 5.$$

We then take the logarithm of both sides and move the exponent down, obtaining

$$9z \log 7 = \log 5.$$

Dividing both sides by  $9 \log 7$ , we find

$$z = \frac{\log 5}{9 \log 7} \approx 0.0919,$$

having used a calculator to find the decimal approximation.

**Problem 3 (2 points):** [GH 3.1.28] Solve for  $t$  if  $57.5 = \frac{(1.003)^{12t} - 1}{.003}$ . Express your answer both as an exact quantity and as a decimal rounded to four decimal places.

**Solution:** In order to solve for  $t$ , we multiply both sides by  $.003$ , obtaining

$$.1725 = (1.003)^{12t} - 1.$$

We then add 1 to both sides, obtaining

$$1.1725 = (1.003)^{12t}.$$

Taking the natural logarithm of both sides and moving the exponent down, we find

$$\log 1.1725 = 12t \log 1.003.$$

Dividing both sides by  $12 \log 1.003$ , we find

$$t = \frac{\log 1.1725}{12 \log 1.003} \approx 4.42713,$$

having used a calculator to find the decimal approximation.