

Quiz 4 – Solutions
MTH 101 – Dr. Shaffer
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Instructions: This quiz is closed book/notes. The work on this quiz must be entirely your own as indicated in the course syllabus. Solve all problems and **show all of your work**.

1. Solve $20 = 50(1.04)^x$ for x using logs. You will need your calculator to get an approximate decimal value for x .

$$\frac{20}{50} = 1.04^x \quad (1)$$

$$\frac{2}{5} = 1.04^x \quad (2)$$

$$\log_{1.04} \frac{2}{5} = x \quad (3)$$

$$x = \frac{\ln \frac{2}{5}}{\ln 1.04} \quad (4)$$

$$x = -23.36 \quad (5)$$

2. One of the main contaminants of a nuclear accident, such as that at Chernobyl, is Strontium-90, which decays exponentially at a rate of approximately 2.5% per year.

- (a) Write the percent of Strontium-90 remaining as a function of years (t) since the nuclear accident.

$$P = e^{-0.025t} \quad (6)$$

- (b) Estimate the half-life of Strontium-90

$$0.5 = e^{-0.025t_{1/2}} \quad (7)$$

$$\ln 0.5 = -0.025t_{1/2} \quad (8)$$

$$t_{1/2} = 27.7 \quad (9)$$

3. \$5000 is invested in a security which yields 5% per year. How much money would this security be worth after 10 years if the interest is compounded...

(a) ...annually?

$$B = P(1 + r)^t \quad (10)$$

$$B = 5000(1 + 0.05)^t \quad (11)$$

$$B = 5000(1.05)^{10} \quad (12)$$

$$B = 8144.47 \quad (13)$$

(b) ...continuously?

$$B = Pe^{rt} \quad (14)$$

$$B = 5000e^{0.05t} \quad (15)$$

$$B = 5000e^{0.05(10)} \quad (16)$$

$$B = 8243.61 \quad (17)$$

4. If $h(x) = x^3 + 1$ and $g(x) = \sqrt{x}$, find

(a) $g(h(x))$

$$g(h(x)) = g(x^3 + 1) = \sqrt{x^3 + 1} \quad (18)$$

(b) $h(h(x))$

$$h(h(x)) = h(x^3 + 1) = (x^3 + 1)^3 + 1 \quad (19)$$

(c) $h(g(x))$

$$h(g(x)) = h(\sqrt{x}) = (\sqrt{x})^3 + 1 = x^{3/2} + 1 \quad (20)$$