Algebra 2-test NAME_____

Newton's law of cooling-55 pts

Solve the following exponential growth problems. **Show the work by writing out the formula** used then showing the proper numbers substituted into the equation.

$A_{(t)} = A_0(1+r)^t$

1. What will be the value of a $100,000 investment 6 years from now if it increases in value at a rate of 7% annually? Round to the nearest cent.

$A_{(t)} = 100,000(1+.07)^6$

150,073

2. A gallon of gas cost $2.43 three years ago. Now it cost $3.92. What has been the annual rate of increase in the cost? Round to the nearest tenth of a <u>percent.</u>

$\frac{3.92}{2.43} = \frac{2.43}{2.43}(1+r)^3$ $r = 17.28\%$

$1.613^{1/3} = (1+r)^{3\,1/3}$

$1.1728 = 1+r$

3. If $1,500 is invested at a rate of 10% annually, how long will it take for the money to double? Round to 3 decimal places.

$\frac{3000}{1500} = \frac{1500(1+.10)^t}{1500}$

$2 = 1.10^t$

$\frac{\log 2}{\log 1.10} = \frac{t \log 1.10}{\log 1.10}$

7.272 years

4. At noon, a dead body is found. The room temperature is 72°F.
A thermometer in the body shows a temperature of 88.4°F
An hour later the thermometer reads 86.3°F
Find the time of death, assuming normal body temperature of 98.6°F
$T = (T_0 - T_r)e^{kt} + T_r$

$$86.3 = (88.4 - 72)e^{k(1)} + 72$$
$$-72 \qquad\qquad -72$$

$$\frac{14.3}{16.4} = \frac{16.4\,e^{k}}{16.4}$$

$$.87195 = e^{k}$$

$$\ln .87195 = k$$

$$k = -.13702$$

Noon

$$88.4 = (98.6 - 72)e^{kt} + 72$$
$$-72 \qquad\qquad -72$$

$$\frac{16.4}{26.6} = \frac{26.6\,e^{kt}}{26.6}$$

$$.61654 = e^{kt}$$

$$\frac{\ln .61654}{k} = \frac{kt}{k}$$

$$\frac{\ln .61654}{(-.13702)}$$

3.529 hrs ago

3 hrs 32 min

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8 : 28