In Class 1, 3, 5

Math III

Name _____

WS Compound Continuous Interest

1. $600 is deposited in an account that pays 7% annual interest, compounded continuously. What is the balance after 5 years?

$P = 600$ $r = 0.07$ $t = 5$

$A = 600e^{0.07(5)}$

$A = \$851.44$

2. $3000 is deposited in an account that pays 5% annual interest. Compare the balance at the end of 10 years for continuous compounding of interest with the balance for quarterly compounding.

$P = 3000$ $r = 0.05$ $t = 10$ $n = 4$

$A = 3000 = e^{0.05(10)}$

$A = \$4946.16$ continuously

$A = 3000\left(1 + \frac{0.05}{4}\right)^{4(10)}$

$A = 3000(1.0125)^{40}$

$A = \$4930.86$ quarterly

3. $1250 is deposited in an account that pays 6.5% annual interest, compounded continuously. What is the balance after 8 years?

$P = 1250$ $r = 0.065$ $t = 8$

$A = 1250e^{0.065(8)}$

$A = \$2102.53$

4. You deposit $1000 in an account that pays 5% annual interest, compounded continuously. How long will it take for the balance to reach $1500?

$P = 1000$ $r = 0.05$ $A = 1500$ $t = ?$

$1500 = 1000e^{0.05t}$

$\frac{3}{2} = e^{0.05t}$

$\ln\frac{3}{2} = 0.05t \ln e$

$t = \frac{\ln 3/2}{0.05}$

$t = 8.1$ yrs

5. You deposit $200 in an account that pays 7% annual interest, compounded continuously. How long will it take for the balance to double?

$P = 200$ $r = 0.07$ $t = ?$ $A = 2(200) = 400$

$400 = 200e^{0.07t}$

$2 = e^{0.07t}$

$\ln 2 = 0.07t \ln e$

$t = \frac{\ln 2}{0.07}$

$t \approx 9.9$ yrs

6. For 1960 through 1986, the amount of municipal waste, W (in pounds per person per day), processed for energy recovery in the United States can be approximated by the equation $W = 0.007e^{0.0057t^2}$, where $t = 0$ represents 1960. In what year did the amount of waste reach 0.22 pound per person?

$0.22 = 0.007e^{0.0057t^2}$

$\frac{0.22}{0.007} = e^{0.0057t^2}$

$\ln\frac{0.22}{0.007} = 0.0057t^2 \ln e$

$t^2 = \frac{\ln\frac{0.22}{0.007}}{0.0057}$

$t = \sqrt{\frac{\ln 0.22/0.007}{0.0057}}$

$t = 24.59$

$1960 + 24$

1984

In Class 2, 4, 7

Math III Name _____

WS Compound Interest

1. How many years will it take $1200 to increase to $1500 if it is invested at 5% compounded semi-annually?

$P=1200$ $n=2$
$A=1500$ $t=?$
$r=0.05$

$1500 = 1200\left(1+\frac{0.05}{2}\right)^{2t}$

$\frac{5}{4} = 1.025^{2t}$

$\log 5/4 = 2t \log 1.025$

$t = \frac{\log 5/4}{2\log 1.025}$

$t \approx 4.52$ yrs

2. In how many years will an investment of $2000 amount to $3000 if the investment draws 6% interest compounded quarterly?

$P=2000$
$A=3000$
$r=0.06$
$n=4$

$3000 = 2000\left(1+\frac{0.06}{4}\right)^{4t}$

$\frac{3}{2} = 1.015^{4t}$

$\log \frac{3}{2} = 4t \log 1.015$

$t = \frac{\log 3/2}{4\log 1.015}$

$t \approx 6.81$ yrs

3. How long will it take $4000 invested at 4% compounded quarterly to grow to $6500?

$P=4000$
$r=0.04$
$n=4$
$A=6500$

$6500 = 4000\left(1+\frac{0.04}{4}\right)^{4t}$

$\frac{13}{8} = 1.01^{4t}$

$\log 13/8 = 4t \log 1.01$

$t = \log 3/8 / 4\log 1.01$

$t \approx 12.20$ yrs

4. How long will it take $3000 invested at 5% compounded semi-annually to grow to $5000?

$P=3000$
$r=0.05$
$n=2$
$A=5000$

$5000 = 3000\left(1+\frac{0.05}{2}\right)^{2t}$

$\frac{5}{3} = 1.025^{2t}$

$\log 5/3 = 2t \log 1.025$

$t = \log 5/3 / 2\log 1.025$

$t \approx 10.34$ yrs

5. How much will $5000 invested at 6% compounded annually amount to after 10 years?

$P=5000$
$r=0.06$
$n=1$
$t=10$

$A = 5000\left(1+\frac{0.06}{1}\right)^{1(10)}$

$A = 5000(1.06)^{10}$

$A = \$8954.24$

6. What amount must be invested now at 8% compounded quarterly to be worth $6000 after 10 years?

$P=?$ $A=6000$
$r=0.08$
$n=4$
$t=10$

$6000 = P\left(1+\frac{0.08}{4}\right)^{4(10)}$

$6000 = P(1.02)^{40}$

$P = \$2717.34$

7. When Melanie was born her parents started an account in her name at 6% interest compounded semi-annually. How much did they invest if she had $7220 on her eighteenth birthday?

$P=?$ $A=7220$
$r=0.06$
$n=2$
$t=18$

$7220 = P\left(1+\frac{0.06}{2}\right)^{2(18)}$

$7220 = P(1.03)^{36}$

$P = \$2491.13$

8. A principal of $5000 is invested at 4% interest compounded annually. How much will the investment amount to after 10 years?

$P=5000$
$r=0.04$
$n=1$
$t=10$

$A = 5000\left(1+\frac{0.04}{1}\right)^{1(10)}$

$A = 5000(1.04)^{10}$

$A = \$7401.22$

9. How much will the investment in Problem #8 amount to after 10 years if the interest is compounded semi-annually?

$P=5000$ $t=10$
$r=0.04$
$n=2$

$A = 5000\left(1+\frac{0.04}{2}\right)^{2(10)}$

$A = 5000(1.02)^{20}$

$A = \$7429.74$

10. The Monarch Savings and Loan Company pays 5% interest on regular passbook accounts, compounded every 4 months. How much will an investment of $6000 be worth after 20 years?

$P=6000$
$r=0.05$
$n=3$ ($\frac{12}{4}=3$)
$t=20$

$A = 6000\left(1+\frac{0.05}{3}\right)^{20(3)}$

$A = 6000(1.0167)^{60}$

$\frac{61}{60}$

$A = \$16,175.82$