

Tue 9

Name: \_\_\_\_\_

ID Number: \_\_\_\_\_

1. Find the amount  $A$  in an account after  $t$  years if

$$\frac{dA}{dt} = .061t, \text{ and } A(0) = 10,000$$

$$\frac{dA}{dt} = .061t.$$

$$\int dA = \int .061t dt.$$

$$A(t) = \frac{.061t^2}{2} + C$$

Solve for  $C$ :

$$A(0) = 10,000 = C$$

$$\text{So, } A(t) = \frac{.061}{2} t^2 + 10,000$$

2. For the function  $R(t) = 8 + 5 \sin(\pi t/40)$

a. Find the exact value of  $R(60)$ .

b. Use your calculator to find  $R(25)$ .

$$a) R(60) = 8 + 5 \sin\left(\frac{60\pi}{40}\right) = 8 + 5 \underbrace{\sin\left(\frac{3}{2}\pi\right)}_{-1} = 8 - 5 = 3$$

$$b) R(25) = 12.6194$$

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1. The projected total sales  $S(t)$  for a new product after  $t$  weeks satisfies .

$$\frac{dS}{dt} = .05(2000 - S), S(0) = 0.$$

Find  $S(30)$ .

This is a limited growth Differential Equation:

$$S(t) = \cancel{1000} 2000(1 - e^{-.05t})$$

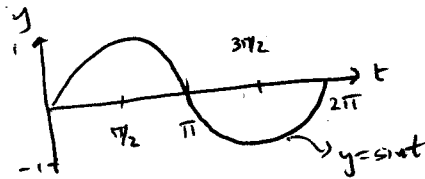
$$S(30) = 2000(1 - e^{-1.5})$$

$$= 1553.73968$$

2. For which values of  $t$  (in radians) in the interval  $0 \leq t \leq 2\pi$  is  $\sin t$

- a. zero?  
b. positive?

Graph of  $y = \sin t$ :



- a)  $t=0, t=\pi, t=2\pi$   
b)  $t \in (0, \pi)$

Tue 11

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1. A radioactive isotope decays in a way that the amount,  $A$  at time  $t$  years satisfies .

$$A'(t) = -.002A.$$

How many years will it take for half of the current amount to decay?

$$\frac{dA}{dt} = -.002A.$$

$$\int \frac{1}{A} dA = \int -.002 dt$$

$$\ln A = -.002t + C,$$

$$A(t) = C e^{-.002t}$$

Want  $t$  with  $A(t) = \frac{1}{2}C$ , since

$$A(0) = C,$$

So,

Solve for  $t$ :

$$\frac{1}{2}C = C e^{-.002t}$$

$$-.002t = \ln\left(\frac{1}{2}\right) = -\ln(2)$$

$$t = \frac{\ln(2)}{.002}$$

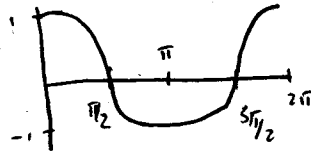
$$\approx 346.5736.$$

2. For which values of  $t$  (in radians) in the interval  $0 \leq t \leq 2\pi$  is

a.  $\cos t = 0$

b.  $\cos t = \sin t$

Graph  $y = \cos t$ :



a)  $t = \pi/2, 3\pi/2$

- b) When  $\cos t = 0$ ,  $\sin t \neq 0$ , so, dividing by  $\cos t$ ,

want  $t$  with

$$1 = \frac{\sin t}{\cos t} = \tan t,$$

This occurs when:

$$t = \frac{\pi}{4}, \frac{5\pi}{4}$$