

# 2002 FRQ #5a

a)  $\frac{dy}{dx} = \frac{3-x}{y}$      $y = f(x)$

tangent at  $y = -2$

$$\frac{dy}{dx} = 0$$

$$y' = 0$$

$f(x)$  tangent at  $(3, -2)$   
to line  $y = -2$

$$\frac{3-x}{-2} = 0$$

$$3-x=0$$

$$x=3$$

1.  $\frac{d^2y}{dx^2} = \frac{-y - \frac{(3-x)^2}{y}}{y^2}$

2. plug in  $3, -2$

3.  $\frac{-(-2) - \frac{(3-3)^2}{-2}}{(-2)^2} = \frac{2}{4} = \frac{1}{2}$

$f''(x)$  is pos at  $(3, -2)$   
which means it is concave  
up which means it is a min.

Method #1

x	y	dy/dx
0	K	2K+1
1	0	

$$\frac{dy}{dx} = 3x + 2y + 1$$

$$y = (2K+1)(1) + K = 0$$

$$0 = 3K + 1$$

$$-1 = 3K$$

$$\boxed{-\frac{1}{3} = K}$$

Method #2

2007 BC5 Part d  
(form B)

x	y	dy/dx
0	$y_0$	
1	0	4

$$y_i = \left(\frac{dy}{dx}\right)(1) + y_0$$

$$0 = \frac{dy}{dx} + y_0$$

$$\frac{dy}{dx} = -y_0$$

$$g'(0) = 2y + 1 = \frac{dy}{dx}$$

$$2y + 1 = -y$$

$$3y + 1 = 0$$

$$3y = -1$$

$$\boxed{y_0 = -\frac{1}{3} = K}$$

2003 BC

X	y	d/dx
1	2	3
1.5	3.5	5
2	6	

$$y = 3(0.5) + 2$$

$$y = 5(0.5) + 3.5$$

$$f(2) \approx 6$$



# 2008 BC 24

carrying capacity = 200

$$\lim_{x \rightarrow \infty} f(x) = 200$$

$$\frac{dP}{dt} = 0.2P - 0.001P^2$$

$$= 0.2P(1 - 0.005P)$$

$$= 0.2P\left(1 - \frac{P}{200}\right)$$

$$M = 200$$

A



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# 2007 FORM B BC5 PART (c)

x	y	dy/dx
0	-2	-3
1/2	-3.5	-4.5
1	-5.75	

$f(0) = -2$   
 $\frac{dy}{dx} = 3x + 2y + 1$   
 $3(0) + 2(-2) + 1 = -4 + 1 = -3$   
 $y = (-4.5)(\frac{1}{2}) + -3.5$   
 $y = -2.25 - 3.5$   
 $y = -5.75$   
 $f(1) = -5.75$

$y = \frac{dy}{dx}(Ax) + y$   
 $\frac{dy}{dx} = 3x + 2y + 1$   
 $3(\frac{1}{2}) + 2(-3.5) + 1 = 1.5 - 7 + 1 = -4.5$





# 2001 BC5 part b

b.)  $f'(x) = -3xf(x)$   $f(1) = 4$

$\Delta x = 0.5$

x	y	$\frac{dy}{dx}$
1	4	-12
1.5	-2	9
2	2.5	

$f'(x) = -3(1)(4) = -12$   
 $f(x) = -12(0.5) + 4$   
 $f'(x) = -3(1.5)(-2)$   
 $f(x) = 9(0.5) + -2$

$f(2) = 2.5$

$$K = 0.2798$$

$$y = 7A^{0.2798(3)}$$

$M = \#$  of Moose

2003 BC  
# 21

$$\frac{dM}{dt} = 0.6M \left( 1 - \frac{M}{200} \right)$$

carrying  
capacity

$t =$  time in years  $M(0) = 50$

$$\lim_{t \rightarrow \infty} M(t) = \boxed{200}$$



$$K = \frac{\ln C}{3}$$

$$\frac{dy}{dx} = \frac{3-x}{y}$$

$$\int y dy = \int (3-x) dx$$

$$\frac{1}{2}y^2 = 3x - \frac{1}{2}x^2 + C$$

$$y^2 = -x^2 + 6x + 2C$$

$$(-4)^2 = -(6)^2 + 6(6) + 2C$$

$$16 = -36 + 36 + 2C$$

$$16 = 2C$$

$$C = 8$$

$$y^2 = -x^2 + 6x + 2 \cdot 8$$

$$y = \sqrt{-x^2 + 6x + 16}$$