



AP[®] Calculus BC 2001 Sample Student Responses

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CALCULUS BC
SECTION II, Part A

Time—45 minutes

Number of problems—3

A graphing calculator is required for some problems or parts of problems.

Work for problem 1(a)

$$\frac{dy}{dt} = \frac{dy/dt}{dx/dt} = \frac{3 \sin(t^2)}{\cos(t^3)} \quad @ t=2, \frac{dy}{dx} = 15.604$$

$$(y - 5) = 15.604(x - 4)$$

Work for problem 1(b)

$$\text{speed} = \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} = \sqrt{\cos^2(t^3) + 9 \sin^2(t^2)}$$

$$@ t=2, \text{ speed} = \boxed{2.275}$$

1 1 1 1 1 1 1 1 1 1

B₂

Work for problem 1(c)

$$\int_0^1 \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt = \int_0^1 \sqrt{\cos^2(t^3) + 9\sin^2(t^3)} dt$$

using calc = 1.458

Work for problem 1(d)

$$x'(t) = \cos(t^3)$$

$$x(t) = F(t) = \int \cos(t^3) dt$$

using calc $\int_2^3 \cos(t^3) dt = F(3) - F(2)$

$-0.0465 = F(3) - 4$ given

$x(3) = F(3) = 3.954$

$$y'(t) = 3 \sin(t^2)$$

$$y(t) = F(t) = \int 3 \sin(t^2) dt$$

$$\int_2^3 3 \sin(t^2) dt = F(3) - F(2)$$

$$-0.0936 = F(3) - 5$$

$y(3) = F(3) = 4.906$

Position
at time
 $t=3$

(3.954, 4.906)

CALCULUS BC
SECTION II, Part A

Time—45 minutes

Number of problems—3

10:70

A graphing calculator is required for some problems or parts of problems.

Work for problem 1(a)

$$\frac{\frac{dy}{dt}}{\frac{dx}{dt}} = \frac{dy}{dx} \quad \frac{3 \sin(t^2)}{\cos(t^3)} \quad \frac{dy}{dx} = \frac{3 \sin(z)^2}{\cos(z)^3}$$

$$\text{slope} = 15.604$$

$$y - 5 = 15.604(x - 4)$$

$$y = 15.604x - 57.417$$

Work for problem 1(b)

$$\frac{dx}{dt} = \cos t^3 = \cos 2^3 = -.146$$

$$\frac{dy}{dt} = 3 \sin t^2 = 3 \sin 2^2 = -2.270$$

$$(-.146)^2 + (-2.270)^2 = 5^2$$

$$5 = \sqrt{\quad}$$

$$5 = 2.275$$

Work for problem 1(c)

$$\int_0^1 \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt = \int_0^1 \sqrt{(\cos t^3)^2 + (3 \sin t^2)^2} dt$$

$$= \int_0^1 \sqrt{\cos^2 t^3 + 9 \sin^2 t^2} dt$$

Work for problem 1(d)

~~$$x = \int \cos t^3 dt =$$~~

~~$$y = 3 \int \sin t^2 dt =$$~~

~~$$\frac{dx}{dt} = \cos t^3$$~~
~~$$\int dx = \int \cos t^3 dt$$~~

$$at \ t = 2$$

$$x = 4$$

$$y = 5$$

$$(3.954, 4.969)$$

~~$$4 + \int_2^3 \cos t^3 dt = x$$~~

$$x = 3.954$$

~~$$5 + \int_2^3 \sin t^2 dt = y$$~~

$$y = 4.969$$