CollegeBoard
Advanced Placement Program

AP® Calculus AB
2005 Sample Student Responses
Form B

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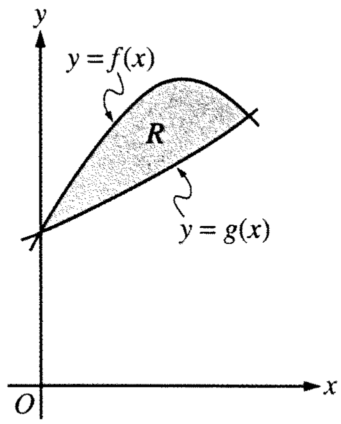
A1

CALCULUS AB
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)

point of intersection
$f(x) = g(x)$
$1 + \sin(2x) = e^{x/2}$
$1 + \sin(2x) - e^{x/2}$
$x = 1.1357$

Area of $R = \int_0^{1.1357} [f(x) - g(x)]\, dx$

$= \int_0^{1.1357} 1 + \sin(2x) - e^{x/2}\ dx$

G.C $= 0.4291$

#

Continue problem 1 on page 5.

Work for problem 1(b)

Volume $= \pi \int_0^{1.1357} R^2 - r^2 \, dx$

$= \pi \int_0^{1.1357} (1+\sin 2x)^2 - (e^{x/2})^2 \, dx$

G.C $= 1.3581\pi$ #

Work for problem 1(c)

Radius $= \dfrac{f(x) - g(x)}{2}$

$= \dfrac{1+\sin(2x) - e^{x/2}}{2}$

Area of cross section $= \frac{1}{2}\pi r^2$

$= \frac{1}{2} \times \pi \times \left(\dfrac{1+\sin(2x) - e^{x/2}}{2}\right)^2$

Volume $= \frac{1}{2}\pi \int_0^{1.1357} \left(\dfrac{1+\sin(2x) - e^{x/2}}{2}\right)^2 dx$

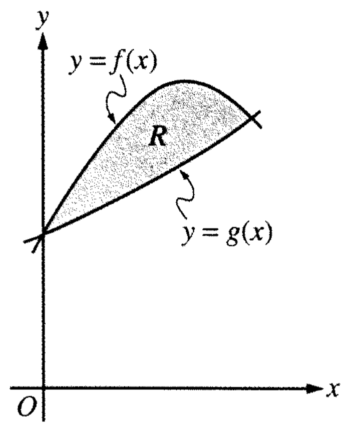
$\approx 0.0247\pi$ #

GO ON TO THE NEXT PAGE.

B1

CALCULUS AB
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)

$$A = \int_a^b f(x) - g(x)\,dx$$

$$= \int_0^{1.1357} \left(1 + \sin(2x) - e^{x/2}\right) dx$$

$$= \boxed{0.429 \text{ units}^2}$$

Continue problem 1 on page 5.

B_2

Work for problem 1(b)

$$V = \pi\int_a^b (R^2 - r^2)\,dx$$

$$= \pi\int_0^{1.1357} \left(\left(1+\sin(2x) - e^{x/2}\right)^2 - \left(e^{x/2}\right)^2\right) dx$$

$$= \boxed{3.9398 \text{ units}^3}$$

Work for problem 1(c)

$$V = \int_a^b A(x)\,dx$$

$$r = \frac{d}{2}$$

$$A_{\text{semicircle}} = \frac{1}{2}\pi r^2$$

$$= \frac{1}{2}\pi\left(\frac{d^2}{4}\right)$$

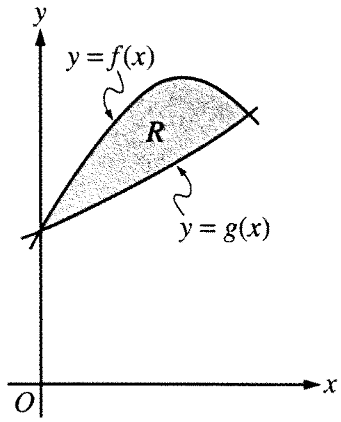
$$= \int_0^{1.1357} \left(\frac{\left(1+\sin(2x) - e^{x/2}\right)^2}{4} \cdot \frac{1}{2}\pi\right) dx$$

$$= \boxed{0.169 \text{ units}^3}$$

GO ON TO THE NEXT PAGE.

CALCULUS AB
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)

$1+\sin(2x) = e^{x/2}$

$x = \cancel{0, 1.336}\;' \; 0, 1.136$

$\int_0^{1.136} \left(1+\sin(2x) - e^{\frac{x}{2}}\right)dx \Rightarrow$ using calculator $\Rightarrow \boxed{0.429}$

Continue problem 1 on page 5.

Work for problem 1(b)

$$= \pi \int_0^{1.136} \left(1 + \sin(2x) - e^{\frac{x}{2}}\right)^2 dx \rightarrow 0.621$$

Work for problem 1(c)

$$\frac{1}{2}\pi \int_0^{1.136} \left(1 + \sin(2x) - e^{\frac{x}{2}}\right)^2 dx.$$

GO ON TO THE NEXT PAGE.

A,

Work for problem 2(a)

$W(15) = 131.782$ gal/hour (water pumped into)

$R(15) = 252.872$ gal/hour (water removed)

Therefore, the amount of water is decreasing b/c $R(t) > W(t)$ when $t=15$, meaning that water is being removed at a higher rate than is water being pumped into the tank.

Work for problem 2(b)

$1200 + \int_0^{18} (W(t) - R(t))\,dt$ = total gallons of water in the tank at $t=18$

$= 1200 + 109.788$

$= 1309.79$

≈ 1310 gallons of water.

Continue problem 2 on page 7.

A₂

Work for problem 2(c)

$W(t) - R(t) = 0 \to$ indicates a max or min.

$t = 0,\ 6.49484,\ 12.9748$

End points : 0, 18.

$1200 + \int_0^{6.49484} (W(t) - R(t))\,dt = \boxed{525 \text{ gallons}}$

$1200 + \int_0^{12.9748} (W(t) - R(t))\,dt = 1697.44$ gallons

$1200 + \int_0^{0} (W(t) - R(t))\,dt = 1200$ gallons

$1200 + \int_0^{18} (W(t) - R(t))\,dt = 1310$ gallons.

Therefore, the amount of water reaches an absolute minimum when $t = 6.49484$.

Work for problem 2(d)

the amount of water, in gallons, when $t = 18$

$1310 - \int_{18}^{k} R(t)\,dt = 0$

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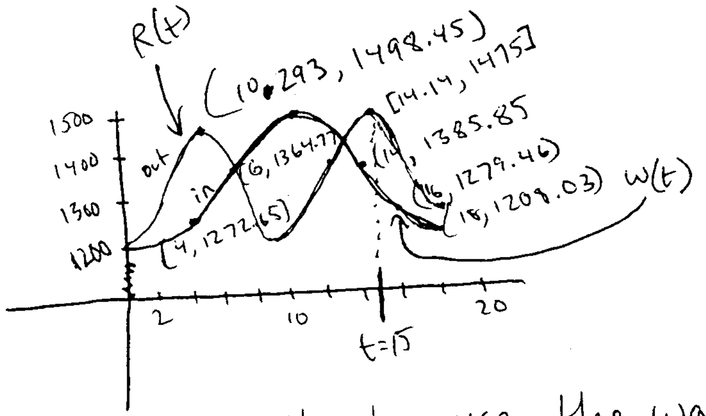
Work for problem 2(a)



No, because the water is being removed at a greater rate than it is being pumped in.

Work for problem 2(b)

1200 + gallons in − gallons out

in: $\int_0^{18} 95\sqrt{t}\,\sin^2(t/6)\,dt \approx 2695.46$ gallons

out: $\int_0^{18} 275\sin^2(t/3)\,dt \approx 2585.67$ gallons

$\approx 1200 + 2695.46 - 2585.67 \approx$

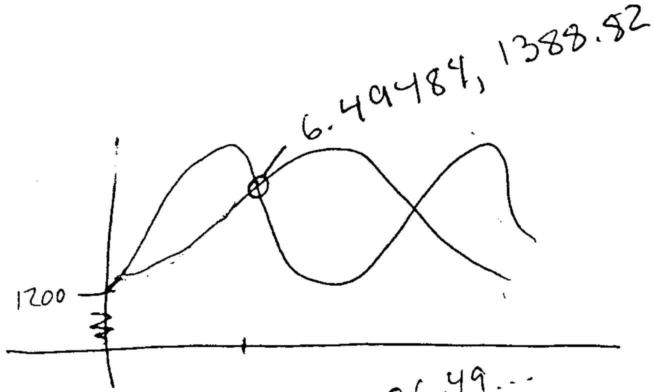
1309.79 gallons

$\approx$ $\boxed{\text{1310 gallons}}$

Continue problem 2 on page 7.

E2

Work for problem 2(c)



$$1200 + \int_0^{6.49...} W(t) - \int_0^{6.49...} R(t)$$

$= 525.242$ gallons

at time $t = 6.49484$, the greatest amout of water has been removed to the amount pumped in; up to $t = 6.49484$, the water level is decreasing.

Work for problem 2(d)

$$\int_{18}^{k} 275 \sin^2 (t/3)\, dt = 1310 \text{ gal.}$$

(the amount removed from time $t = 18$ to some time k is approximately 1310 gallons)

GO ON TO THE NEXT PAGE.

Work for problem 2(a)

$S(t) = 95\sqrt{t}\sin^2\left(\frac{1}{6}t\right) - 275\sin^2\left(\frac{1}{3}t\right)$

$S(15) = 95\sqrt{15}\sin^2\left(\frac{15}{6}\right) - 275\sin^2\left(\frac{1}{3}(15)\right) = -121.09$ gallons

so, no water isn't increasing but decreasing

Work for problem 2(b)

$\int_0^{18}\left(95\sqrt{t}\sin^2\left(\frac{1}{6}t\right) - 275\sin^2\left(\frac{1}{3}t\right)\right)dt = \boxed{109.79}$ gallons

Continue problem 2 on page 7.

Work for problem 2(c)

$$95\sqrt{t}\sin^2\left(\tfrac{1}{6}t\right) - 275\sin^2\left(\tfrac{1}{3}t\right) = 0$$

$$95\sqrt{t}\sin^2\left(\tfrac{1}{6}t\right) = 275\sin^2\left(\tfrac{1}{3}t\right)$$

$$\frac{\sin^2\left(\frac{1}{6}t\right)}{\sin^2\left(\frac{1}{3}t\right)} = \frac{275}{95\sqrt{t}}$$

$$\frac{\sqrt{t}\sin^2\left(\frac{1}{6}t\right)}{\sin^2\left(\frac{1}{3}t\right)} = \frac{27}{95}$$

Work for problem 2(d)

$$\int_{18}^{K}\left(275\sin^2\left(\tfrac{t}{3}\right)\right)dt = 0$$

GO ON TO THE NEXT PAGE.

Work for problem 3(a)

a) $a(t) = (v(t))' = (\ln(t^2-3t+3))'$;

$a(4) = (\ln(t^2-3t+3))'\Big|_{t=4} = 0{,}714$.

Answer: $a(4) = 0{,}714$

Work for problem 3(b)

b) Particle changes direction $\Leftrightarrow$ $v(t)$ changes sign.

$\Rightarrow$ $v(t) = 0$ $\Leftrightarrow$ $\ln(t^2-3t+3) = 0$;

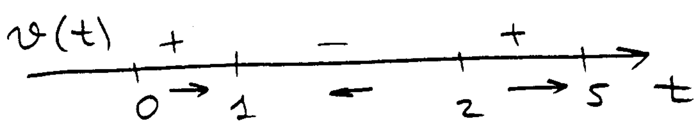
$t^2-3t+3 = 1$;

$t^2-3t+2 = 0$;

$\left[\begin{array}{l} t = 2 \\ t = 1 \end{array}\right.$;

Particle changes direction at $t = 1$ and $t = 2$

is moving leftwards at time $1 < t < 2$.



Continue problem 3 on page 9.

A

Work for problem 3(c)

c) $x(t) = \int_0^t (v(t))\,dt + x(0)$;

$x(2) = \int_0^2 (\ln(x^2 - 3x + 3))\,dt + 8$;

$x(2) = 8{,}3686$;

Answer: $x(2) \approx 8{,}368$.

Work for problem 3(d)

d) Speed $= |v(t)|$;

average speed over the interval $0 \le t \le 2$:

$= \frac{1}{2} \int_0^2 (|v(t)|)\,dt = \frac{1}{2} \int_0^2 (|\ln(t^2 - 3t + 3)|)\,dt$

average speed $= 0{,}370509$.

Answer: $0{,}371$.

END OF PART A OF SECTION II

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON PART A ONLY. DO NOT GO ON TO PART B UNTIL YOU ARE TOLD TO DO SO.

Work for problem 3(a)

find $a(t)$ when $t=4$

$0 \le t \le 5$

$v(t) = \ln(t^2 - 3t + 3)$

$x = 8$
$t = 0$

$a(t) = v'(t)$

$a(4) = v'(4)$

$a(4) = .714$

Work for problem 3(b)

particle changes direction when $v(t)$ changes from +ve → −ve or −ve → +ve

.8

left movement when

$s(t) > 0$ and $v(t) < 0$

$s(t) < 0$ and $v(t) < 0$

so when $v(t) = 0$

$\ln(t^2 - 3t + 3) = 0$

$t = 1, 2$

The particle changes direction when $t = 1, 2$.

Continue problem 3 on page 9.

P

Work for problem 3(c)

$t=2$

$s(t)=?$

$\int v(t)\,dt = s(t)$

$s(2)= \int_0^2 \ln(t^2-3t+3)\,dt$

$s(2) \quad = .369$

at $t=0$, $x=8$

So $.369+8 = \underline{\underline{8.369}}$

Work for problem 3(d)

Av speed $= \frac{1}{2-0}\int_0^2 \ln(t^2-3t+3)\,dt$

$= .184$

END OF PART A OF SECTION II

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON PART A ONLY. DO NOT GO ON TO PART B UNTIL YOU ARE TOLD TO DO SO.

Work for problem 3(a)

$v(t) = \ln(t^2 - 3t + 3)$, $0 \le t \le 5$

$a(t) = v'(t) = \frac{1}{t^2-3t+3} \cdot (2t-3) = \frac{2t-3}{t^2-3t+3}$

$a(4) = \frac{5}{16-12+3} = \frac{5}{7}$

Work for problem 3(b)

a particle changes direction when

$v(t) = \ln(t^2-3t+3) = 0$.

using calculator: $t = 2$, $t = 1$

in times $t=1$, $t=2$ particle changes its direction.

Particle moves to the left in the interval between $t=1$ and $t=2$,

i.e. $t \in (1;2)$

Continue problem 3 on page 9.

Work for problem 3(c)

$s(t)$ - the position of particle.

$(t) = \int v(t)\,dt = \int \ln(t^2 - 3t + 3)\,dt = \frac{-3\ln(|\cancel{t}^2 - \cancel{3t} + 3|)}{2} + t\ln(t^2 - 3.$

$2t + \frac{\sqrt{3}\,\pi \cdot \tan^{-1}\left(\frac{\sqrt{3}(2t-3)}{3}\right)}{180}$.

$s(2) = \frac{-3\ln|1|}{2} + 2\ln 1 - 4 + \frac{\sqrt{3}\,\pi\,\tan^{-1}\left(\frac{\sqrt{3}}{3}\right)}{180} = \frac{\sqrt{3}\cdot\pi\cdot 30}{180} - 4 =$

$= \frac{\sqrt{3}\,\pi}{6} - 4 = -3{,}09$

$s(0) = -\frac{3\ln 3}{2} + \frac{\sqrt{3}\,\pi \cdot -60}{180} = -\frac{3}{2}\ln 3 + \frac{\sqrt{3}}{2}\pi$

Work for problem 3(d)

speed = |velocity|

Average speed $= \left|\frac{s(2) - s(0)}{2-0}\right| = \left|\frac{-3.09 - s(0)}{2}\right| =$

$= \left|\frac{-3{,}09 + 1{,}37}{2}\right| = 0{,}86$

END OF PART A OF SECTION II

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON PART A ONLY. DO NOT GO ON TO PART B UNTIL YOU ARE TOLD TO DO SO.

A1

NO CALCULATOR ALLOWED

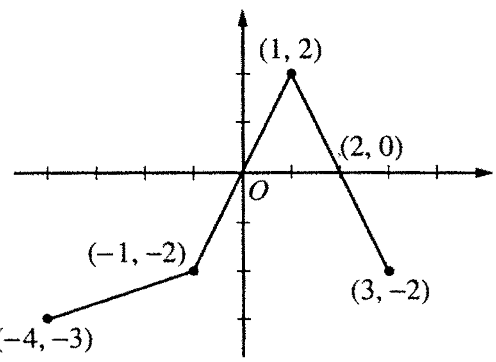
CALCULUS AB

SECTION II, Part B

Time—45 minutes

Number of problems—3

No calculator is allowed for these problems.



Graph of f

Vork for problem 4(a)

$g(-1) = \int_{-4}^{-1} f(t)\,dt$

$= \frac{-3+(-2)}{2}(3)$

$= \frac{-15}{2}$

$g'(-1) = f(-1)$

$= -2$

$g''(-1) = f'(-1)$

$g''(-1)$ does not exist

Continue problem 4 on page 11.

NO CALCULATOR ALLOWED

Work for problem 4(b)

$g(x)$ has an inflection pt when $x=1$

$g''(x) = f'(x)$

inflection pt occurs when $f'(x)$ goes from + to − or from − to + (concavity change). This happens when $x=1$

Work for problem 4(c)

$h(x) = \int_x^3 f(t)\,dt$

$h(x)$ is 0 when $x = 3, 1, -1$

$\int_3^3 f(t)\,dt$, $\int_1^3 f(t)\,dt$, $\int_{-1}^3 f(t)\,dt$ are all zero.

Work for problem 4(d)

$h(x)$ decreases when $0<x<2$.

$h'(x) = -f(t)$ $\left(h(x) = \int_x^3 f(t)\,dt \right)$

$\therefore$ $h'(x)<0$ when $f(t)>0$.

$f(t)>0$ when $0<x<2$.

GO ON TO THE NEXT PAGE.

B1

NO CALCULATOR ALLOWED

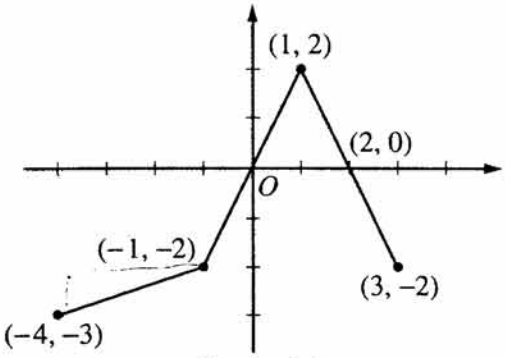
CALCULUS AB

SECTION II, Part B

Time—45 minutes

Number of problems—3

No calculator is allowed for these problems.



Graph of f

Work for problem 4(a)

$g(-1) = \int_{-4}^{-1} f(t)\,dt = -\frac{3}{2} - 6 = -7.5$

$g'(-1) = f(-1) = -2$

$g''(-1)$ does not exist, since $f'(-1)$ does not exis

($f(x)$ is not differentiable at point $x=-1$)

Continue problem 4 on page 11.

B2

NO CALCULATOR ALLOWED

Work for problem 4(b)

$g''(x) = f'(x)$

$g''(x) = 0 \Rightarrow f'(x) = 0$, but there are no points where $f'(x) = 0$ on the interval $(-4;3) \Rightarrow$ there are no points of inflection of function $g(x)$ on the same interval $(-4;3)$

Work for problem 4(c)

There is only ~~one~~ two values of $x \Rightarrow$

$x = 1,\ x = -1$

$h(x) = \int_x^3 f(t)\,dt$

$h(1) = 1 - 1 = 0$, $h(-1) = 1 - 1 + 1 - 1 = 0$

Work for problem 4(d)

$h'(x) = \left(-\int_3^x f(t)dt\right)' = -f(x)$

$h'(x) < 0$ for $h(x)$ to decrease $\Rightarrow f(x) > 0 \Rightarrow x \in [0;2]$

GO ON TO THE NEXT PAGE.

C1

NO CALCULATOR ALLOWED

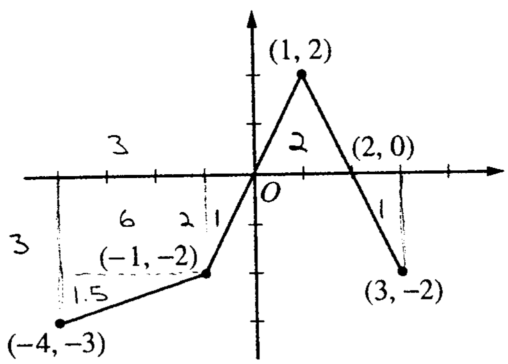
CALCULUS AB

SECTION II, Part B

Time—45 minutes

Number of problems—3

No calculator is allowed for these problems.



Graph of f

$g'(x) = f(t)$

$g''(x) = f'(t)$

Work for problem 4(a)

$$g(-1) = \int_{-4}^{-1} f(t)\,dt = 7.5$$

$g'(-1) = -2$

$g''(-1) =$ does not exist

Continue problem 4 on page 11.

C2

NO CALCULATOR ALLOWED

Work for problem 4(b)

g(x) experiences a point of inflection where $g''(x) = 0$ $(f'(t) = 0)$, hence it is where f(t) has critical points. $x = 1$

Work for problem 4(c)

$x = -1$, where $h(x) = 0$

Work for problem 4(d)

where $h'(x)$ = negative, hence $(-4, -1)(-1, 0)(2, 3)$.

GO ON TO THE NEXT PAGE.

A-1

NO CALCULATOR ALLOWED

Work for problem 5(a)

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

$$(2y - x)\frac{dy}{dx} = y$$

$$\frac{dy}{dx} = \frac{y}{2y-x}$$

Work for problem 5(b)

$\frac{dy}{dx}$ = slope of the tangent $\qquad \frac{1}{2} = \frac{y}{2y-x}$

$2y = 2y - x \Rightarrow x = 0$

$x=0 \Rightarrow y^2 = 2 \Rightarrow y = +\sqrt{2}$ or $-\sqrt{2}$

$(0, \sqrt{2})$ and $(0, -\sqrt{2})$ are points on the curve where the tangent has slope $\frac{1}{2}$

Continue problem 5 on page 13.

NO CALCULATOR ALLOWED

Work for problem 5(c)

~~line~~ line tangent is horizontal $\Rightarrow$ slope of tangent is zero $\Rightarrow \frac{dy}{dx} = 0$

if ~~for~~ $\frac{dy}{dx} = 0$, then $y = 0$

substituting $y = 0$ in $y^2 = 2 + xy$ gives $0 = 2$ which is false

$\therefore$ $\frac{dy}{dx}$ cannot be zero $\Rightarrow$ there is no point (x, y) where the line tangent to the curve is horizontal

Work for problem 5(d)

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

$y = 3 \Rightarrow 9 = 2 + 3x \Rightarrow 3x = 7 \Rightarrow x = \frac{7}{3}$

at $t = 5$:

$$2(3)(6) = \frac{dx}{dt}(3) + (6)\left(\frac{7}{3}\right)$$

$$36 = 3\frac{dx}{dt} + 14$$

$$\frac{dx}{dt} = \frac{36 - 14}{3}$$

$$\frac{dx}{dt} = \frac{22}{3}$$

GO ON TO THE NEXT PAGE.

B-1

NO CALCULATOR ALLOWED

Work for problem 5(a)

$y^2 = 2 + xy$

$\frac{dy}{dx} = \frac{y}{2y-x}$

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

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

$2y\frac{dy}{dx} - x\frac{dy}{dx} = y$

$\frac{dy}{dx}(2y-x) = y$

$\boxed{\frac{dy}{dx} = \frac{y}{2y-x}}$

Work for problem 5(b)

(x, y) $\quad y - y_1 = m(x - x_1)$

$\frac{y}{2y-x} = \frac{1}{2}$

$2y = 2y - x$

$y = y - \frac{1}{2}x$

$y + \frac{1}{2}x = y$

$-y \qquad -y$

$y^2 = 2 + xy$

$\frac{1}{2}x = 0$

$x = 0$

$y^2 = 2 + 0(y)$

$y^2 = 2 + 0$

$y = \pm\sqrt{2}$

$\boxed{\begin{array}{c}(0, \sqrt{2}) \\ (0, -\sqrt{2})\end{array}}$

Continue problem 5 on page 13.

B-2

NO CALCULATOR ALLOWED

Work for problem 5(c)

$f'(c) = 0$

$\frac{y}{2y-x} = 0$ $\quad \frac{y}{2y-x} = 0 \quad \frac{0}{-x} = 0$

$y = 0(2y-x)$

$y = 0$ can't solve for x at $f'(c) = 0$.

Work for problem 5(d)

$y^2 = 2 + xy$ $\quad y = 3$

$2y\frac{dy}{dt} = \frac{dx}{dt}y + \frac{dy}{dt}x$ $\quad \frac{dy}{dt} = 6$

$t = 5$

$\frac{2y\frac{dy}{dt} - \frac{dy}{dt}x}{y} = \frac{dx}{dt}$ $\quad \frac{2(3)(6) - 6(5)}{3} = \frac{dx}{dt}$

$\frac{36 - 30}{3} = \frac{dx}{dt}$

$\frac{6}{3} = \frac{dx}{dt} = 2$

GO ON TO THE NEXT PAGE.

 C-1

Work for problem 5(a)

$y^2 = 2 + xy$

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

$(2y - x)\frac{\delta y}{dx} = y$

$\frac{dy}{dx} = \frac{y}{2y - x}$

Work for problem 5(b)

$\frac{1}{2} = \frac{y}{2y - x}$

$-x = 2y$

$x = 0$

$+ \quad x = 0,\ y = \sqrt{2})$

$0, \sqrt{2})$

Continue problem 5 on page 13.

 C-2

NO CALCULATOR ALLOWED

Work for problem 5(c)

$$\frac{dy}{dx} = \frac{y}{2y-x}$$

$y^2 = 2 + xy$

$\therefore 2y \neq x$

Work for problem 5(d)

$y^2 = 2 + xy$

$2y\frac{dy}{dt} = x\frac{\delta y}{dt} + y\frac{\delta x}{dt}$

GO ON TO THE NEXT PAGE.

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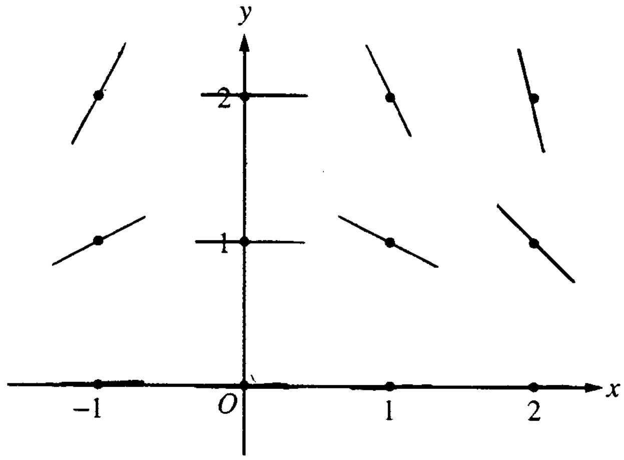
NO CALCULATOR ALLOWED

Work for problem 6(a)



$$\frac{dy}{dx} = \frac{-xy^2}{2}$$

$$\frac{-(2)(1)}{2}$$

$$\frac{-(2)(4)}{2}$$

$$-\frac{(-1)(1)}{2} \quad \frac{-(-1)(4)}{2}$$

Work for problem 6(b)

$f(-1) = 2$

$$\frac{dy}{dx} = \frac{-xy^2}{2} = \frac{-(-1)(4)}{2} = 2$$

$y = m(x - x_1) + y_1$

$y = 2(x - (-1)) + 2$

$\underline{\underline{y = 2x + 4}}$

Continue problem 6 on page 15.

NO CALCULATOR ALLOWED

Work for problem 6(c)

$$\frac{dy}{dx} = \frac{-xy^2}{2}$$

$$2\,dy = -xy^2\,dx$$

$$\frac{2}{y^2}\,dy = x\,dx$$

$$-2(y^{-2})\,dy = \int x\,dx$$

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

$$-1) = 2$$

$$2(2^{-1}) = \frac{1}{2}(-1)^2 + C$$

$$1 = \frac{1}{2} + C$$

$$C = \frac{1}{2}$$

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

$$\frac{1}{y} = \frac{1}{4}x^2 + \frac{1}{4}$$

$$\frac{1}{y} = \frac{x^2+1}{4}$$

$$y = \frac{4}{x^2+1}$$

END OF EXAM

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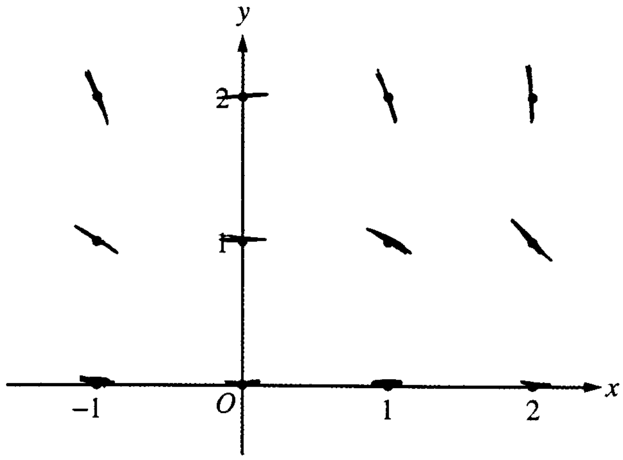
B1

NO CALCULATOR ALLOWED

Work for problem 6(a)



dy/dx	x	y
0	0	0
$-1/2$	1	1
-2	1	2
-1	2	1
-4	2	2
$1/2$	-1	1
2	-1	2

Work for problem 6(b)

$y-2=m(x+1)$

$y-2=2(x+1)$

$\boxed{y=2x}$

$+\frac{4}{2}=2$

Continue problem 6 on page 15.

B2

6 6 6 6 6 6 6 6 6 6

NO CALCULATOR ALLOWED

Work for problem 6(c)

$$\int \frac{dy}{y^2} = \int \frac{-x\,dx}{2}$$

$$\ln|y^2| = -\tfrac{1}{4}x^2 + C$$

$$\ln 4 = -\tfrac{1}{4} + C$$

$$4 = Ce^{-1/4}$$

$$4/e^{-1/4} = C$$

$$y^2 = Ce^{-x^2/4}$$

$$y = \sqrt{Ce^{-x^2/4}}$$

$$\boxed{y = \sqrt{4e^{1/4}e^{-x^2/4}}}$$

END OF EXAM

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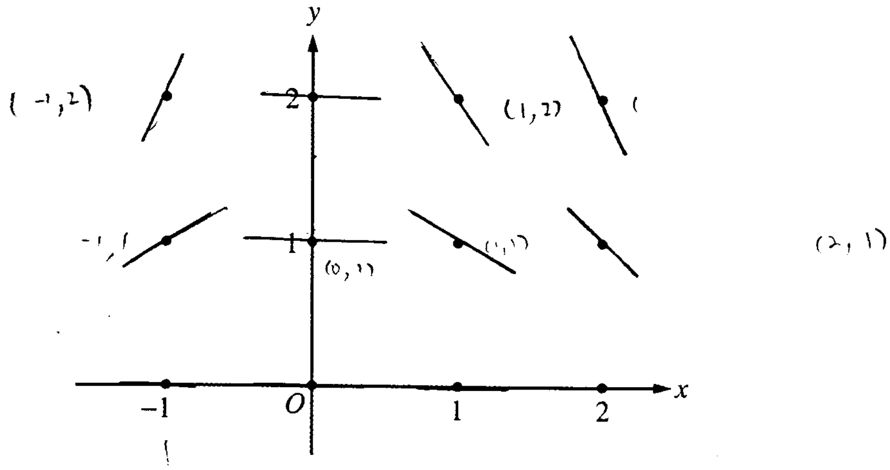
C1

6 6 6 6 6 6 6 6 6 6

NO CALCULATOR ALLOWED

Work for problem 6(a)



Work for problem 6(b)

(-1, 2)

$$\frac{dy}{dx} = \frac{1 x^4}{2} = 2$$

$$y = 2(x+1)+2$$

Continue problem 6 on page 15.

C_2

NO CALCULATOR ALLOWED

Work for problem 6(c)

$\frac{dy}{dx} = \frac{-xy^2}{2}$

$2dy = -xy^2\, dx$

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

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

$(-1, 2)$

$4 = \frac{8}{3} + c$

$c = \frac{12}{3} - \frac{8}{3}$

$= \frac{4}{3}$

$2y = -\frac{1}{3} x y^3 + \frac{4}{3}$

$y = -\frac{1}{6} x y^3 + \frac{4}{6}$

END OF EXAM

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