Practice Differential Equations Multiple Choice Questions

1. No Calculator: If $\frac{dy}{dx}=\frac{3x^2+2}{y}$, and $y=4$ when $x=2$, then when $x=3$, $y=$

(a) 18 (b) $\sqrt{66}$ (c) 58 (d) $\sqrt{74}$ (e) $\sqrt{58}$

2. No Calculator: The function f is continuous on the closed interval $[0,4]$, and twice differentiable on the open interval $(0,4)$. If $f'(2)=-5$ and $f''(x)>0$ over the interval $(0,4)$, which of the following could be a table of values for f?

A	
x	y
0	10
1	7.5
2	6
3	4.5
4	2

B	
x	y
0	10
1	7.5
2	6.5
3	3.5
4	2

C	
x	y
0	10
1	7
2	4.5
3	3
4	2.5

D	
x	y
0	10
1	8
2	6
3	4
4	2

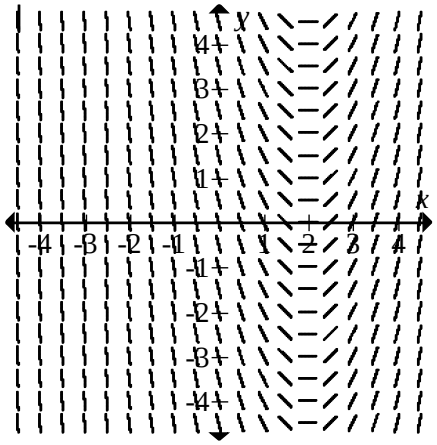
E	
x	y
0	10
1	8.5
2	5.5
3	3.5
4	2.5

3. No Calculator: If $f'(x)=12x^2-6x+3$ and $f(1)=15$. What is $f(x)$?

(a) $4x^3-3x^2+3x+1$
(b) $4x^3-3x^2+3x+11$
(c) $4x^3-6x^2+3x+1$
(d) $12x^3-6x-12$
(e) $4x^3-3x^2+3x-11$

4. No Calculator: Shown at right is the slope field for which of the following differential equations?

(a) $\frac{dy}{dx}=2x$
(b) $\frac{dy}{dx}=2x-4$
(c) $\frac{dy}{dx}=4-2x$
(d) $\frac{dy}{dx}=y$
(e) $\frac{dy}{dx}=x+y$



5. No Calculator: Water is being pumped continuously from a water pool at a rate proportional to the amount of water left in the pool; that is $\frac{dy}{dt} = ky$, where y is the amount of water left in the pool at any time t, and k is a constant. Initially, there were 500,000 gallons of water in the pool, and 10 days later, there were 100,000 gallons of water in the pool. What is the equation for y, the amount of water remaining in the pool at any time t ?

(a) $y(t) = 500{,}000\left(\frac{1}{2}\right)^{\frac{t}{10}}$

(b) $y(t) = 500{,}000e^{\frac{1}{5}t}$

(c) $y(t) = 500{,}000\left(\frac{1}{10}\right)^{\frac{t}{10}}$

(d) $y(t) = 500{,}000\left(\frac{1}{5}\right)^{\frac{t}{10}}$

(e) $y(t) = 500{,}000e^{10t}$

6. No Calculator: Let f be the function whose derivative is $\frac{dy}{dx} = \frac{1+e^x}{x^2}$ and whose graph passes through the point $(3,6)$. What is the approximate value of $f(3.1)$ if $\int_3^{3.1} f'(x)\,dx \approx 0.2377$?

(a) 6.238 (b) 2.414 (c) 6.1 (d) –5.762 (e) –2.414

7. No Calculator: Shown at right is the slope field for which of the following differential equations?

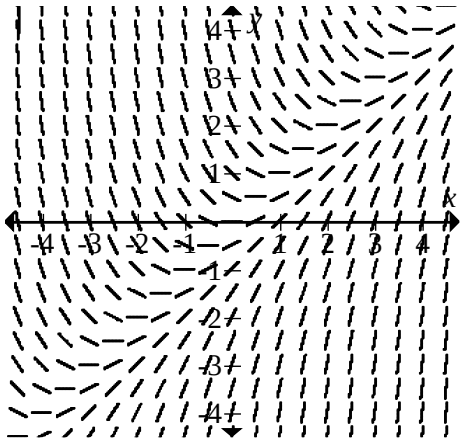
(a) $\frac{dy}{dx} = x - y$

(b) $\frac{dy}{dx} = x + y$

(c) $\frac{dy}{dx} = xy$

(d) $\frac{dy}{dx} = e^x$

(e) $\frac{dy}{dx} = x^2$



8. No Calculator: Let $\frac{dy}{dx} = e^{x-y}$, which of the following is a solution to the differential equation such that $y(0) = 1$?

(a) $y = \ln(x)$ (b) $y = \ln(e^x + e)$ (c) $y = x$ (d) $y = e^x$ (e) $y = \ln(e^x + e - 1)$

9. No Calculator: The slope field for a certain differential equation is shown at right. Which of the following could be a specific solution to that differential equation.

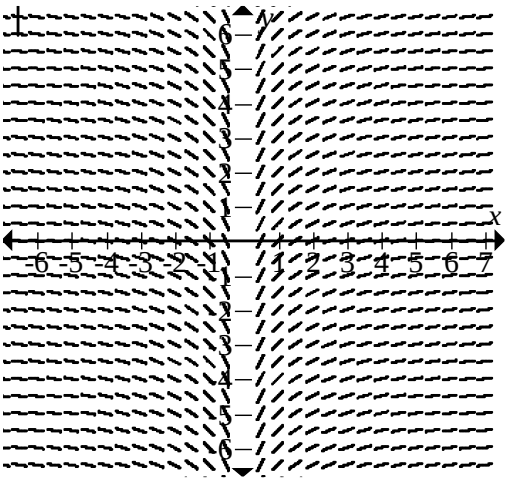
(a) $y = x^3$

(b) $y = e^x$

(c) $y = e^{-x}$

(d) $y = \cos(x)$

(e) $y = \ln(x)$



10. No Calculator: Shown at right is a slope field for which of the following differential equations?

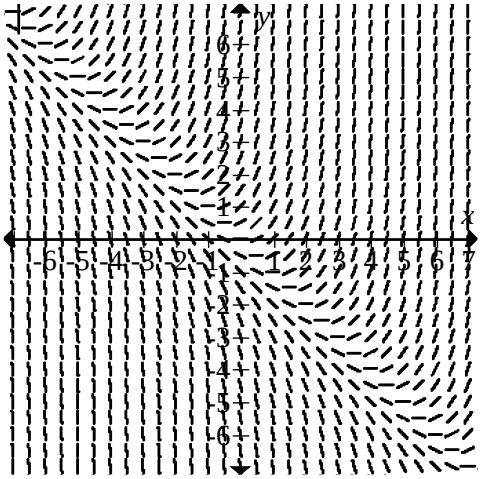
(a) $\frac{dy}{dx} = 1 + x$

(b) $\frac{dy}{dx} = x^2$

(c) $\frac{dy}{dx} = x + y$

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

(e) $\frac{dy}{dx} = \ln(x)$



11. No calculator: Let $y = f(x)$ be the solution to the differential equation $\frac{dy}{dx} = x + y$ with the initial condition $f(1) = 2$. What is the approximation for $f(2)$ if Euler's method is used, starting at $x = 1$ with a step size of 0.5?

(a) 3 (b) 5 (c) 6 (d) 10 (e) 12

12. Calculator required: A pizza heated to a temperature of 475°F is taken out of an oven and placed in a 105°F room at $t = 0$ minutes. The temperature of the pizza is changing at a rate of $-256e^{-0.7t}$ °F/minute. To the nearest degree, what is the temperature of the pizza at $t = 9$ minutes?

(a) 100 (b) 80 (c) 110 (d) 115 (e) 120

13. No Calculator: Shown at right is the slope field of which differential equation?

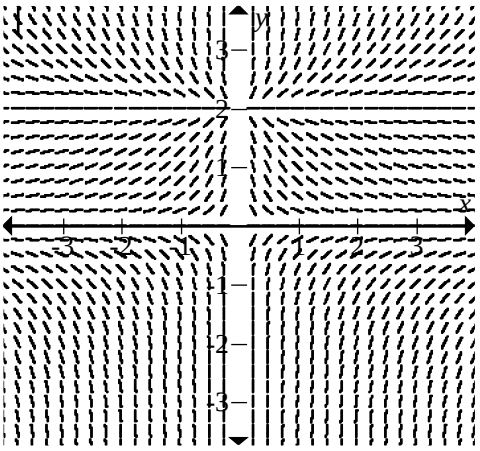
(a) * $\frac{dy}{dx} = \frac{y^2 - 2y}{x}$

(b) $\frac{dy}{dx} = \frac{3x^2 - 4}{x}$

(c) $\frac{dy}{dx} = \frac{3y^2 - 4}{4}$

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

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



14. No Calculator: Shown at right is the slope field for which differential equation?

(a) $\frac{dy}{dx} = 1 + y^2$

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

(c) $\frac{dy}{dx} = 2x^2$

(d) $\frac{dy}{dx} = 1 + x^2$

(e) $\frac{dy}{dx} = 1 - y^2 + x^2$