16. $\lim\limits_{x\to3^-} \dfrac{|x-3|}{x-3}$ is

   (A) −3   (B) −1   (C) 1   (D) 3   (E) nonexistent

17. If $f(x) = ae^{-ax}$ for $a > 0$, then $f'(x) =$

   (A) e^{-ax}

   (B) ae^{-ax}

   (C) a^2e^{-ax}

   (D) $-ae^{-ax}$

   (E) $-a^2e^{-ax}$

18. A student attempted to solve the differential equation $\dfrac{dy}{dx} = xy$ with initial condition $y = 2$ when $x = 0$. In which step, if any, does an error first appear?

   Step 1: $\int \dfrac{1}{y}\,dy = \int x\,dx$

   Step 2: $\ln|y| = \dfrac{x^2}{2} + C$

   Step 3: $|y| = e^{x^2/2} + C$

   Step 4: Since $y = 2$ when $x = 0$, $2 = e^0 + C$.

   Step 5: $y = e^{x^2/2} + 1$

   (A) Step 2
   (B) Step 3
   (C) Step 4
   (D) Step 5
   (E) There is no error in the solution.

19. For what values of x does the graph of $y = 3x^5 + 10x^4$ have a point of inflection?

(A) $x = -\dfrac{8}{3}$ only

(B) $x = -2$ only

(C) $x = 0$ only

(D) $x = 0$ and $x = -\dfrac{8}{3}$

(E) $x = 0$ and $x = -2$

20. $\displaystyle\lim_{x \to 2} \dfrac{\ln(x+3) - \ln(5)}{x - 2}$ is

(A) 0   (B) $\dfrac{1}{5}$ (C) $\dfrac{1}{2}$ (D) 1   (E) nonexistent

Consider the differential equation $\dfrac{dy}{dx} = \left(1 - \dfrac{2}{x^2}\right)(y - 1)$, where $x \neq 0$.

Let $y = f(x)$ be the particular solution to the differential equation with initial condition $f(1) = 2$.

(a) Find the slope of the line tangent to the graph of f at the point $(1, 2)$.

(b) On the axes provided, sketch a slope field for the given differential equation at the nine points indicated.

(c) Find the particular solution $y = f(x)$ to the differential equation

$\dfrac{dy}{dx} = \left(1 - \dfrac{2}{x^2}\right)(y - 1)$ with initial condition $f(1) = 2$.