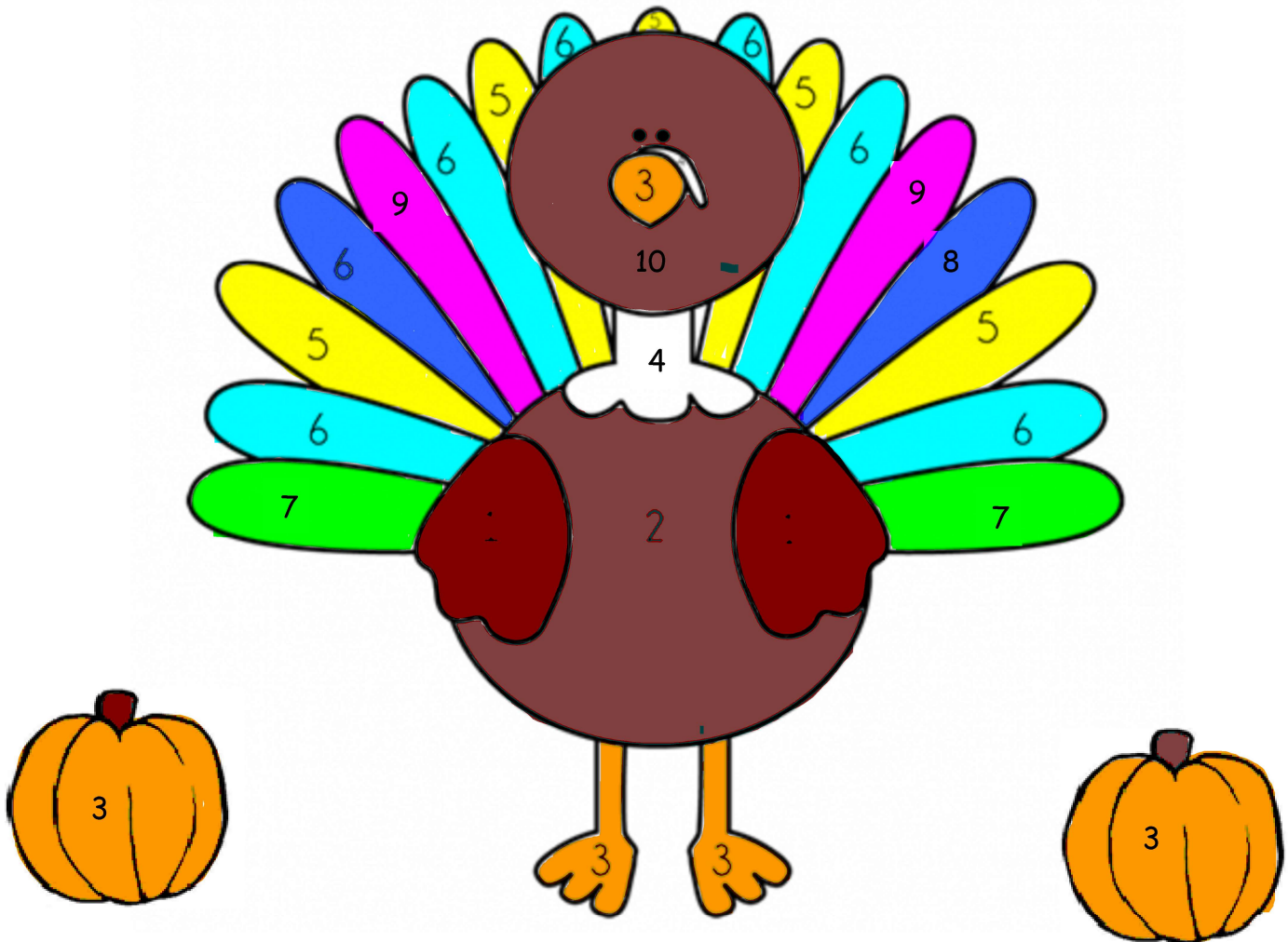


Chapter 5 Differentiation Practice

Directions: Find the derivative of each function at the indicated point. You must show all work algebraically! Use the answer chart to fill in each part of the picture with the indicated color.



Questions	
1.)	$f(x) = \ln(4x)e^{4x}$ at $x = 1$
2.)	$f(x) = \ln(\operatorname{arccot}(x))$ at $x = 1$
3.)	$f(x) = \sin(\arccos(x))$ at $x = \frac{\sqrt{3}}{2}$
4.)	$f(x) = x(\arcsin(x)) + \sqrt{1-x^2}$ at $x = -\frac{1}{2}$
5.)	$f(x) = \arccos\left(\frac{1}{x}\right)$ at $x = -2$
6.)	$f(x) = x^{\ln x}$ at $x = e$
7.)	$f(x) = (\ln x)^2$ at $x = 4$
8.)	$f(x) = \frac{\sin(x)}{2 - \cos(x)}$ at $x = \frac{\pi}{3}$
9.)	$f(x) = \ln(x^2 + 1)$ at $x = 2$
10.)	$f(x) = e^{\sqrt{x}}$ at $x = 1$

Answers	Color
1. $e^4 + \ln 256e^4$	Dark Brown
4. $-\frac{\pi}{2}$	White
7. $\ln 2$	Green
9. $x = \frac{4}{5}$	Purple
3. $-\sqrt{3}$	Orange
2. $-\frac{2}{\pi}$	Light brown
10. $\frac{e}{2}$	Light Brown
5. $\frac{\sqrt{3}}{6}$	Yellow
6. 2	Light Blue
8. 0	Blue

$$1. f'(x) = \frac{4}{4x} e^{4x} + \ln(4x) e^{4x} \cdot 4$$

$$= \frac{e^{4x}}{x} + 4e^{4x} \ln(4x)$$

$$f'(1) = \frac{e^4}{1} + 4e^4 \ln 4 = e^4 + e^4 \ln 256$$

$$2. f'(x) = \frac{1}{\operatorname{arccot} x} \cdot \frac{-1}{1+x^2}$$

$$f'(1) = \frac{1}{\frac{\pi}{4}} \cdot \frac{-1}{2}$$

$$= -\frac{4}{2\pi} = -\frac{2}{\pi}$$

$$3. f'(x) = \cos(\arccos(x)) \cdot \frac{-1}{\sqrt{1-x^2}} = \frac{-x}{\sqrt{1-x^2}}$$

$$f'\left(\frac{\sqrt{3}}{2}\right) = \frac{-\frac{\sqrt{3}}{2}}{\sqrt{1-\frac{3}{4}}} = -\frac{\sqrt{3}}{2} \cdot 2 = -\sqrt{3}$$

$$4. f'(x) = \arcsin(x) + \frac{x}{\sqrt{1-x^2}} - \frac{x}{\sqrt{1-x^2}} = \arcsin x$$

$$f'\left(-\frac{1}{2}\right) = \arcsin\left(-\frac{1}{2}\right) = -\frac{\pi}{6}$$

$$5. f'(x) = \frac{1}{\sqrt{1-x^2}} \cdot \frac{-1}{x^2} - \frac{1}{x} \cdot \frac{1}{\sqrt{1-x^2}}$$

$$f'(-2) = \frac{1}{1-2\sqrt{3}} = \frac{\sqrt{3}}{6}$$

$$6. \ln y = \ln x \ln x$$

$$\frac{1}{y} y' = \frac{2 \ln x}{x}$$

$$y' = \frac{2x^{\ln x} \ln x}{x} \quad y'|_e = \frac{2e^1 \cdot 1}{e} = 2$$

$$7. f'(x) = \frac{2 \ln x}{x} \quad f'(4) = \frac{2 \ln 4}{4} = \ln 2$$

$$8. f'(x) = \frac{\cos x (2 - \cos x) - \sin^2 x}{(2 - \cos x)^2}$$

$$f'(x) = \frac{2 \cos x - 1}{(2 - \cos x)^2}$$

$$= \frac{2\left(\frac{1}{2}\right) - 1}{\left(2 - \frac{1}{2}\right)^2}$$

$$9. f'(x) = \frac{1}{x^2+1} \cdot 2x$$

$$f'(2) = \frac{4}{5}$$

$$10. f'(x) = \frac{e^{\sqrt{x}}}{2\sqrt{x}}$$

$$f'(1) = \frac{e}{2}$$