

# Homework Set 3

## Notation and Basic Derivatives

(sect 2.3, 3.3, 3.5)

Compute the derivatives of the following functions.

1.  $f(x) = -235$

$$f'(x) = 0$$

2.  $q(x) = \sin x$

$$q'(x) = \cos x$$

3.  $y = \sqrt{x}$

$$\frac{dy}{dx} = \frac{1}{2\sqrt{x}}$$

4.  $y = x^5$

$$\frac{dy}{dx} = 5x^4$$

5.  $g(t) = -\cos t$

$$g'(t) = \sin t$$

6.  $z(a) = e^a$

$$z'(a) = e^a$$

7.  $h(s) = \frac{1}{s^4} = s^{-4}$

$$h'(s) = -4s^{-5} = -\frac{4}{s^5}$$

8.  $y = \tan x$

$$\frac{dy}{dx} = \sec^2 x$$

9.  $k(t) = 7t$

$$k'(t) = 7$$

10.  $p(x) = -3 \sec x$

$$p'(x) = -3 \sec x \tan x$$

Perform the indicated operation.

11.  $\frac{d}{dt}(2t^{1/4} - 5t^{2/5})$

$$= \frac{1}{2}t^{-3/4} - 2t^{-3/5}$$

12.  $D(\ln|x|)$

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

13.  $\frac{d}{dx} \arctan x$

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

14.  $\frac{d^4}{dt^4} \cos t$

$$\frac{d}{dt} \cos t = -\sin t$$

$$\frac{d^2}{dt^2} \cos t = -\cos t$$

$$\frac{d^3}{dt^3} \cos t = \sin t$$

$$\frac{d^4}{dt^4} \cos t = \cos t$$

15.  $\frac{d}{dx} [2 \log_5 x - \arcsin x]$

$$= \frac{2}{x \ln 5} - \frac{1}{\sqrt{1-x^2}}$$

$$\begin{aligned}
 16. \frac{d}{ds} \left( 3^s - \frac{2}{\sqrt{s}} \right) &= \frac{d}{ds} (3^s - 2s^{-1/2}) \\
 &= 3^s \ln 3 + s^{-3/2} \\
 &= 3^s \ln 3 + \frac{1}{\sqrt{s^3}}
 \end{aligned}$$

17. Find  $f'(\theta)$  where  $f(\theta) = a\theta^2 + 5 \sin \theta$

$$f'(\theta) = 2a\theta + 5 \cos \theta$$

18.  $D_y(2xy - x^2 + y^2)$

$$= 2x + 2y$$

19. Find  $f''(x)$  where  $f(x) = e^x - 2x + 1$ .

$$f'(x) = e^x - 2$$

$$f''(x) = e^x$$

20.  $\frac{d^3}{dx^3}(x^3 - 2x + \sin x)$

$$\frac{d}{dx}(x^3 - 2x + \sin x) = 3x^2 - 2 + \cos x$$

$$\frac{d^2}{dx^2}(x^3 - 2x + \sin x) = 6x - \sin x$$

$$\frac{d^3}{dx^3}(x^3 - 2x + \sin x) = 6 - \cos x$$