Exercise: Topic 4

A.

1. (a) $f'(x)=0$ (b) $g'(x)=0$
   (c) $f'(x)=-5$ (d) $f'(x)=3$
   (e) $f'(x)=3x^2-12$ (f) $f'(x)=-2/x^3$
   (g) $f'(x) = -\frac{1}{(x-1)^2}$ (h) $f'(x)= \frac{1}{2\sqrt{x+1}}$

2. (a) $f'(2)=5$ (b) $f'(0) = \frac{1}{2\sqrt{2}}$

B.

3. (a) $f'(x)=0$ (b) $y' = \frac{1}{5x^{4/5}}$
   (c) $g'(x) = 40x^7 + 4x + 7$ (d) $g'(x) = \frac{-2}{x^3} - \frac{2}{x^2}$
   (e) $h'(t) = \frac{-3}{t^7} + \frac{4}{3t^5} - \frac{1}{t^2}$ (f) $y' = \frac{-2}{x^3} + \frac{6}{x^4}$
   (g) $y' = \frac{3}{2}\sqrt{x} - \frac{1}{2\sqrt{x}}$ (h) $f'(x) = 4x^3 + 3x^2 - 1$
   (i) $y' = \frac{-20x^4+75x^2+16x}{(-4x^2+5)^2}$ (j) $y' = \frac{3}{2}\sqrt{x} + \frac{2}{\sqrt{x}} - \frac{3}{2\sqrt{x}^3}$

4. (a) $f'(x) = 1 + 3\cos x$ (b) $f'(x) = 2\cos x - 5sec^2 x$
   (c) $f'(x) = x\cos x + \sin x$ (d) $\frac{dy}{dx} = -2\csc x \cot x - 3\sin x$
   (e) $dy/dx = \frac{2\sin x - 3}{\cos^2 x}$ (f) $dy/dx = \frac{1-\cos x}{\sin^2 x}$

5. $y' = \frac{1}{4}\cos\frac{1}{4}x$
   $y' = 4e^{4x}$
   $y' = \frac{1}{4}e^{\frac{1}{4}x}$
   $y' = \frac{1}{x}$

6. (a) $7(x^3 - 4x)^6(3x^2 - 4)$ (b) $\frac{(2-4x^3)}{4(1+2x-x^4)^{1/2}}$
   (c) $\frac{8x^3}{3(2+x^4)^{1/3}}$ (d) $\cos x \sec^2(\sin x)$
   (e) $-3x^2\sin(x^3)$ (f) $2x^2e^{x^2} + e^{x^2}$
   (g) $-3e^{5x}\sin(3x+1) + 5e^{5x}\cos(3x+1)$ (h) $\frac{2x}{x^2-10}$
   (i) $-\tan x$ (j) $\frac{1}{5x}(\ln x)^{-4/5}$

7. (a) $2\cos x - x\sin x$ (b) 2

C.

8. (a) $a(1)=-6\ m/s^2$, $a(3)=6\ m/s^2$
   (b) $v(2)=-3\ m/s$
   (c) Total distance $=6\ m$

9. (a) $t=0,\ 5$
   (b) $t = 1 + \sqrt{\frac{13}{3}}$, velocity is constant (there is no change in velocity)

10. (a) 100 ft
    (b) Velocity on its way up: 16 ft/s
    (c) Velocity on its way down: -16 ft/s

D.

11.

	Graph 1	Graph 2
Absolute maximum	$f(4)=5$	*There is no abs max value*
Absolute minimum	*There is no abs min value*	$f(4)=1$
Local maximum	$f(4)=5$ and $f(6)=4$	$f(3)=4$ and $f(6)=3$
Local minimum	$f(1)=f(5)=3$ and $f(2)=2$ *Note:f(0) is not a local min because it occurs at endpoint.*	$f(2)=2$ and $f(4)=1$

12. (a) $x=1/3$
    (b) $x=-2,\ 3$
    (c) $x=-5,1$
    (d) *There is no critical number*

Endpoints can be either absolute max/min but not local max/min

13.

Absolute maximum	Absolute minimum
$f(2)=16$	$f(5) = 7$
$f(3) =93$	$f(4) =-291$
$f(-1) =8$	$f(2) =-19$
$f(0) = 5$	$f(-3) =-76$
$f(3) =28$	$f(2) =-31$
$f(2) =27$	$f(0) =-1$