HW 8

#2

$(\cos(2\sin x))'$

$= -(\sin(2\sin x)) \times (2\sin x)'$

$= -\sin(2\sin x) \times 2\cos x$

$= -2\cos x \sin(2\sin x)$

#7

$f'(t)$

$= -\sin(\tan(\sin t)) \times (\tan(\sin t))'$

$= -\sin(\tan(\sin t)) \times \sec^2(\sin t) \times (\sin t)'$

$= -\sin(\tan(\sin t)) \times \sec^2(\sin t) \times \cos t$

$= -\cos t \sec^2(\sin t) \sin(\tan(\sin t))$

#13

$19\cos(\cos(6x))$

$= -19\sin(\cos(6x)) \times \cos'(6x)$

$= -19\sin(\cos(6x)) \times -\sin(6x) \times 6$

$$= 114 \sin(6x) \sin(\cos(6x))$$

when $x = \frac{\pi}{2}$

$$= 114 \underbrace{\sin 3\pi}_{0} \sin(\cos 3\pi)$$

$$= 0$$

14. $\sqrt{\cos^2(5x) + \sin^2(5x)}$

$$= \sqrt{1}$$

$$= 1$$

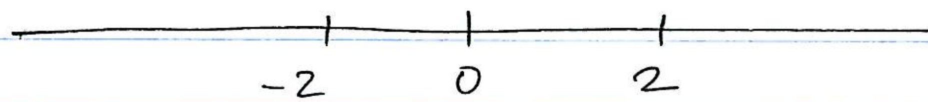
$$1' = 0$$

HW 9

2.10

#3 $f'(x) = 40\, x(x^2-4)$

$= 40\, x\, (x-2)\, (x+2)$



$x < -2$ $\quad x+2 < 0$

$x-2 < 0 \quad \Rightarrow f'(x) < 0$

$x < 0$ $\quad$ f decreasing

$-2 < x < 0$ $\quad x+2 > 0$

$x-2 < 0 \quad \Rightarrow f'(x) > 0$

$x < 0$ $\quad$ f increasing

$0 < x < 2$ $\quad x-2 < 0$

$x+2 > 0 \quad \Rightarrow f'(x) < 0$

$x > 0$ $\quad$ f decreasing

$x > 2$ $\quad (x-2) > 0$

$x+2 > 0 \quad \Rightarrow f'(x) > 0$

$x > 0$ $\quad$ f increasing

7 $f'(x) = 15x^2 + 8$

$f'(x)$ is always +ve

$\Rightarrow f(x)$ is increasing

$\Rightarrow f$ is one-to-one $\Rightarrow$ f has an inverse.

$y = f^{-1}(x)$

$f(y) = x$

$\Rightarrow$ Differentiating w.r.t. x.

$$f'(y)\frac{dy}{dx} = 1$$

$$\Rightarrow \frac{dy}{dx} = \frac{1}{f'(y)} = \frac{1}{15y^2+8}$$

9 $f'(x) = 3x^2 - 8x - 1$

$$f'(x) = 0 \Rightarrow x = \frac{8 \pm \sqrt{64+12}}{6}$$

$$= \frac{8 \pm \sqrt{76}}{6}$$

$$= \frac{8 \pm 2\sqrt{19}}{6} = \frac{4 \pm \sqrt{19}}{3}$$

$$f'(x) = \left(x - \frac{4+\sqrt{19}}{3}\right)\left(x - \left(\frac{4-\sqrt{19}}{3}\right)\right)$$

If $x > \frac{4+\sqrt{19}}{3}$, $f'(x) > 0$ f is increasing

If $\frac{4-\sqrt{19}}{3} < x < \frac{4+\sqrt{19}}{3}$ $f'(x) < 0$ f is decreasing.

If $x < \frac{4-\sqrt{19}}{3}$ $f'(x) > 0$ f is increasing

f has max at $x = \frac{4-\sqrt{19}}{3}$ (it is called a local max)

f has min at $x = \frac{4+\sqrt{19}}{3}$ (local min.)

There is no absolute min or max since
$f(x) \to -\infty$ as $x \to -\infty$
& $f(x) \to \infty$ as $x \to \infty$.