1.

# 136.151: Test #1
## 20 minutes

**Name:**_____ **Student Number:** _____

**1.** Consider the following three lines.

$l_1: \ y = 2x + 1$
$l_2: \ y - 2x = 10$
$l_3: \ 2y = -x + 4$

Which of these lines are mutually parallel, which are mutually perpendicular? Why?

**Solution.**
For $l_1$ we are given that $y = 2x + 1$ so that the slope of that line is $m_1 = 2$.
For $l_2$ we find that $y = 2x + 10$ so that the slope of that line is $m_2 = 2$.
For $l_3$ we find that $y = -\frac{1}{2}x + 2$ so that the slope of that line is $m_3 = -\frac{1}{2}$.

Since $m_1 = m_2$, the first two lines are parallel. Since $m_1 = -\frac{1}{m_3}$, the first and the third line are perpendicular. Consequently, so are the second and the third.

**2.** Find the domain of the function $f(x) = \sqrt{1-2x}$. Show your work.

**Solution.**
We must have that $1 - 2x \geq 0$. Solve this: $1 - 2x \geq 0 \Leftrightarrow 1 \geq 2x \Leftrightarrow \frac{1}{2} \geq x$. So, the domain of the function $f(x)$ is the interval $(-\infty, \frac{1}{2}]$.

**3.** (a) Show that $f(x) = x^3 + x$ is an odd function.
(b) Which of the functions $g(x) = x^4 + 1$ and $h(x) = x^4 + x$ is even? Is any of these two functions odd?

**Solution.**
(a) $f(-x) = (-x)^3 + (-x) = -(x^3 + x) = -f(x)$ so the function $f(x)$ is indeed odd.
(b) $g(x)$ is even. Both are not odd.

**4.** Compute $\lim_{x \to 1} \frac{(x+3)(x-1)}{x^2 - 3x + 2}$. Show your work.

**Solution.**

$$\lim_{x \to 1} \frac{(x+3)(x-1)}{x^2 - 3x + 2} = \lim_{x \to 1} \frac{(x+3)(x-1)}{(x-2)(x-1)} = \lim_{x \to 1} \frac{(x+3)}{(x-2)} = -4.$$