TMA04 - Q3a)b)
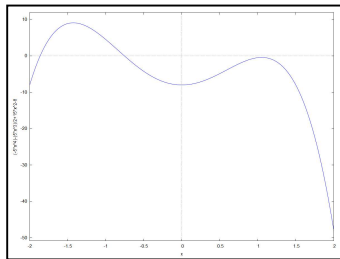
1 *Part a)*

U(x):=−5·x^4−5·x^3/2+15·x^2−8;

$$U(x):=(-5)\,x^4 - \frac{5\,x^3}{2} + 15\,x^2 - 8$$

wxplot2d(U(x),[x,−2,2]);

Total mechical energy given as: E = mv^2/2+U(x)

E:−5;
a:E−U(x);
kill(b);
b:U(x)−E;
z:allroots(a); /*the range or ranges of x-values (accurate to one decimal place) that could represent a motion of the system*/
allroots(b);
fpprintprec : 2;

for i:1 thru 2 do disp(z[i]);
for i:3 thru length(z) do disp(z[i]);

/* range is from [-2.0,1.4] */

$$-5$$

$$5\,x^4 + \frac{5\,x^3}{2} - 15\,x^2 + 3$$

done

$$-5\,x^4 - \frac{5\,x^3}{2} + 15\,x^2 - 3$$

$$[x=0.49\,,x=-0.45\,,x=1.4\,,x=-2.0]$$
$$[x=0.49\,,x=-0.45\,,x=1.4\,,x=-2.0]$$

$$2$$
$x=0.49$
$x=-0.45$
    done
$x=1.4$
$x=-2.0$
    done

2 Part b)

```
kill(E);
E:10;
kill(c);
c:E−U(x);
d:allroots(c);
lindex:length(d);
for i:1 thru lindex do disp(d[i]);
```

    done
    10
    done

$$5\,x^4+\frac{5\,x^3}{2}-15\,x^2+18$$

$[x=0.5637185154442473\,\%i+1.185973063850168, x=1.185973063850168-0.5637185154442473\,\%i, x=0.1605371721026794\,\%i-1.435973063850168, x=-0.1605371721026794\,\%i-1.435973063850168]$

$$4$$

$x=0.5637185154442473\,\%i+1.185973063850168$
$x=1.185973063850168-0.5637185154442473\,\%i$
$x=0.1605371721026794\,\%i-1.435973063850168$
$x=-0.1605371721026794\,\%i-1.435973063850168$
    done

/* all output values are complex values meaning no possible motions for x, since kinetic energy will be < zero. */