1. (**1**) **i**. $3y = 8y + 13x^2$, so $5y = -13x^2$. This equation includes an x^2 term with a negative coefficient, so the graph is a parabola which turns downwards. Also, the y-intercept is 0. Hence the matching graph is Graph S.

ii. $13x + 7 = 3y$. Hence this is a straight line, with positive gradient and positive y-intercept. Hence the matching graph is Graph G.

iii. $-3x + 2 = -10x$, so $7x = -2$, so $x = -\frac{2}{7}$. Hence this is a vertical line, with x negative. Hence the matching graph is Graph A.

iv. $y = e^{-5x}$, which is a graph of exponential decay. Hence the matching graph is Graph L.

v. $4 = 5y + 8x + 11$, so $5y = -8x - 7$. Hence this is a straight line, with negative gradient and negative y-intercept. Hence the matching graph is Graph J.

vi. $-10y + 11 = -11y - 3$, so $y = -14$. Hence this is a horizontal line, with y negative. Hence the matching graph is Graph D.

vii. $7x^2 + 4 = y$. This equation includes an x^2 term with a positive coefficient, so the graph is a parabola which turns upwards. Also, the y-intercept is positive. Hence the matching graph is Graph O.

viii. $y = e^{2x}$, which is a graph of exponential growth. Hence the matching graph is Graph K.

(**2**) Let P be the amount invested, r be the interest rate per time period, n be the number of time periods and F be the final value. In each case, $P = 200$. Then:

i. Interest compounds annually, so we use the rate and number of time periods given in the question.
Hence $r = 8.0\% = 0.08$ and $n = 8$, so $F = 200 \times (1 + 0.08)^8 = 200 \times 1.08^8 \approx 370.19$.
The final balance is \$370.19.

ii. Interest compounds twice a year, so we need to halve the rate and double the number of time periods given in the question.
Hence $r = 4.0\% = 0.04$ and $n = 16$, so $F = 200 \times (1 + 0.04)^{16} = 200 \times 1.04^{16} \approx 374.60$.
The final balance is \$374.60.

iii. Interest compounds 4 times a year, so we need to divide the given rate by 4 and multiply the given number of years by 4.
Hence $r = 2.0\% = 0.02$ and $n = 32$, so $F = 200 \times (1 + 0.02)^{32} = 200 \times 1.02^{32} \approx 376.91$.
The final balance is \$376.91.

iv. Interest compounds 12 times a year, so we need to divide the given rate by 12 and multiply the given number of years by 12.
Hence $r = 0.7\% = 0.0067$ and $n = 96$, so $F = 200 \times (1 + 0.0067)^{96} = 200 \times 1.0067^{96} \approx 378.49$.
The final balance is \$378.49.

v. Interest compounds continuously, so $F = 200e^{0.08\times 8} = 200e^{0.64} \approx 379.30$.
The final balance is \$379.30.

(**3**) Given an angle a in radians, to convert a to degrees you multiply by 180 and divide by π. Hence the converted angles are:

$$99^\circ \quad 18^\circ \quad 0^\circ \quad 414^\circ \quad 200^\circ \quad 405^\circ \quad 360^\circ \quad 3600^\circ$$

(**4**) Given an angle a in degrees, to convert a to radians you divide by 180 and multiply by π. Hence the converted angles are:

$$\pi \quad -\frac{\pi}{3} \quad -\frac{\pi}{4} \quad \frac{11\pi}{10} \quad 3\pi \quad -\frac{4\pi}{5} \quad -\frac{6\pi}{5} \quad -11\pi$$

(**5**) **i.** $\log_7 7^{10} = 10$

ii. $3 = 3^1$, so $\log_3 3 = 1$

iii. $\frac{1}{8} = 2^{-3}$, so $\log_2 \frac{1}{8} = \log_2 2^{-3} = -3$. Hence the answer is -3.

iv. $1000000 = 10^6$, so $\log_{10} 1000000 = 6$

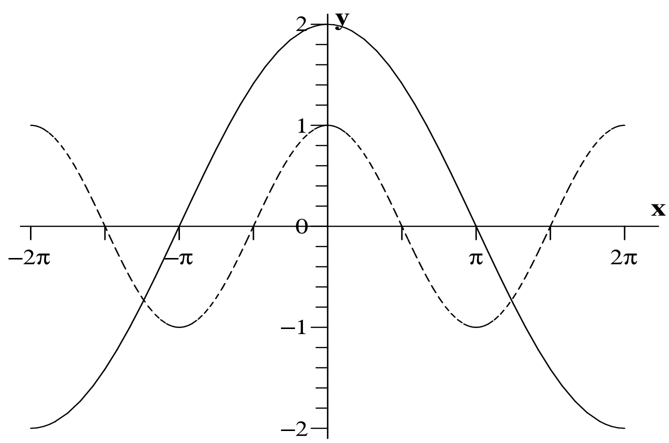
v. $\frac{1}{10000} = 10^{-4}$, so $\log_{10} \frac{1}{10000} = -4$

vi. $e = e^1$, so $\ln e = 1$

vii. $\frac{1}{e^2} = e^{-2}$, so $\ln \frac{1}{e^2} = \ln e^{-2} = -2$. Hence the answer is -2.

viii. $4 = 64^{\frac{1}{3}}$, so $\log_{64} 4 = \frac{1}{3}$

(**6**) The graph of $y = \cos x$ is dashed; the graph of $y_1 = 2\cos\frac{x}{2}$ is solid.



2. (**1**) **i.** $-11y - 7x^2 + 12 = -12y + 16x^2 + 14$, so $y = 23x^2 + 2$. This equation includes an x^2 term with a positive coefficient, so the graph is a parabola which turns upwards. Also, the y-intercept is positive. Hence the matching graph is Graph O.

ii. $-15y = -3y - 16x - 3$, so $12y = 16x + 3$. Hence this is a straight line, with positive gradient and positive y-intercept. Hence the matching graph is Graph G.

iii. $12y + 13x^2 = 14y - 16x^2 + 11$, so $2y = 29x^2 - 11$. This equation includes an x^2 term with a positive coefficient, so the graph is a parabola which turns upwards. Also, the y-intercept is negative. Hence the matching graph is Graph Q.

iv. $12x = -8$, so $x = -\frac{8}{12}$. Hence this is a vertical line, with x negative. Hence the matching graph is Graph A.

v. $y = e^{7x}$, which is a graph of exponential growth. Hence the matching graph is Graph K.

vi. $13y - 14 = 15y - 4x$, so $2y = 4x - 14$. Hence this is a straight line, with positive gradient and negative y-intercept. Hence the matching graph is Graph E.

vii. $5 = -11y - 12$, so $11y = -17$, so $y = -\frac{17}{11}$. Hence this is a horizontal line, with y negative. Hence the matching graph is Graph D.

viii. $y = -10 \times |-11x|$, so $y = -10 \times |11x|$, which is a graph of negative absolute value. Hence the matching graph is Graph M.

(**2**) Let P be the amount invested, r be the interest rate per time period, n be the number of time periods and F be the final value. In each case, $P = 100$. Then:

i. Interest compounds annually, so we use the rate and number of time periods given in the question.
Hence $r = 6.0\% = 0.06$ and $n = 4$, so $F = 100 \times (1 + 0.06)^4 = 100 \times 1.06^4 \approx 126.25$.
The final balance is \$126.25.

ii. Interest compounds twice a year, so we need to halve the rate and double the number of time periods given in the question.
Hence $r = 3.0\% = 0.03$ and $n = 8$, so $F = 100 \times (1 + 0.03)^8 = 100 \times 1.03^8 \approx 126.68$.
The final balance is \$126.68.

iii. Interest compounds 4 times a year, so we need to divide the given rate by 4 and multiply the given number of years by 4.
Hence $r = 1.5\% = 0.015$ and $n = 16$, so $F = 100 \times (1 + 0.015)^{16} = 100 \times 1.015^{16} \approx 126.90$.
The final balance is \$126.90.

iv. Interest compounds 12 times a year, so we need to divide the given rate by 12 and multiply the given number of years by 12.
Hence $r = 0.5\% = 0.005$ and $n = 48$, so $F = 100 \times (1 + 0.005)^{48} = 100 \times 1.005^{48} \approx 127.05$.
The final balance is \$127.05.

v. Interest compounds continuously, so $F = 100e^{0.06\times4} = 100e^{0.24} \approx 127.12$.
The final balance is \$127.12.

(**3**) Given an angle a in radians, to convert a to degrees you multiply by 180 and divide by π. Hence the converted angles are:

$$72^\circ \quad -252^\circ \quad -270^\circ \quad -360^\circ \quad -180^\circ \quad -192^\circ \quad -440^\circ \quad 40^\circ$$

(**4**) Given an angle a in degrees, to convert a to radians you divide by 180 and multiply by π. Hence the converted angles are:

$$-\frac{6\pi}{5} \quad \frac{5\pi}{3} \quad -\frac{2\pi}{3} \quad 3\pi \quad \pi \quad \frac{6\pi}{5} \quad \frac{7\pi}{3} \quad -\frac{2\pi}{9}$$

(**5**) **i**. $\log_{15} 15^{18} = 18$

ii. $64 = 4^3$, so $\log_4 64 = 3$

iii. $\frac{1}{5} = 5^{-1}$, so $\log_5 \frac{1}{5} = \log_5 5^{-1} = -1$. Hence the answer is -1.

iv. $1000 = 10^3$, so $\log_{10} 1000 = 3$

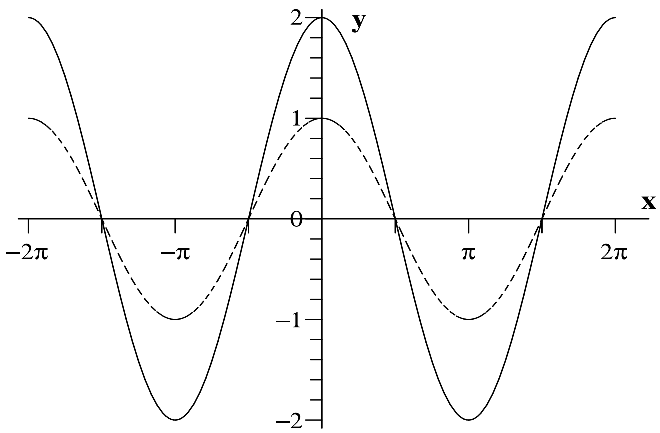
v. $\frac{1}{10} = 10^{-1}$, so $\log_{10} \frac{1}{10} = -1$

vi. $\ln e^8 = 8$

vii. $\frac{1}{e^{20}} = e^{-20}$, so $\ln \frac{1}{e^{20}} = \ln e^{-20} = -20$. Hence the answer is -20.

viii. $4 = 64^{\frac{1}{3}}$, so $\log_{64} 4 = \frac{1}{3}$

(**6**) The graph of $y = \cos x$ is dashed; the graph of $y_1 = 2\cos x$ is solid.



3. (**1**) **i.** $y = 7 \times |9x|$, which is a graph of absolute value. Hence the matching graph is Graph N.

ii. $-7y - 7 = -6y - x - 7$, so $y = x$. Hence this is a straight line, with positive gradient and passing through the origin. Hence the matching graph is Graph F.

iii. $13y - 8x^2 = 14y - 9x^2$, so $y = x^2$. This equation includes an x^2 term with a positive coefficient, so the graph is a parabola which turns upwards. Also, the y-intercept is 0. Hence the matching graph is Graph P.

iv. $8y - 15 = 9y + 7x^2 - 16$, so $y = -7x^2 + 1$. This equation includes an x^2 term with a negative coefficient, so the graph is a parabola which turns downwards. Also, the y-intercept is positive. Hence the matching graph is Graph R.

v. $2x^2 - 5 = 15y + 9x^2 - 5$, so $15y = -7x^2$. This equation includes an x^2 term with a negative coefficient, so the graph is a parabola which turns downwards. Also, the y-intercept is 0. Hence the matching graph is Graph S.

vi. $14y - 2x^2 - 3 = 15y + 6x^2$, so $y = -8x^2 - 3$. This equation includes an x^2 term with a negative coefficient, so the graph is a parabola which turns downwards. Also, the y-intercept is negative. Hence the matching graph is Graph T.

vii. $13y = -14x$. Hence this is a straight line, with negative gradient and passing through the origin. Hence the matching graph is Graph I.

viii. $y = e^{-6x}$, which is a graph of exponential decay. Hence the matching graph is Graph L.

(**2**) Let P be the amount invested, r be the interest rate per time period, n be the number of time periods and F be the final value. In each case, $P = 400$. Then:

i. Interest compounds annually, so we use the rate and number of time periods given in the question.
Hence $r = 9.0\% = 0.09$ and $n = 5$, so $F = 400 \times (1 + 0.09)^5 = 400 \times 1.09^5 \approx 615.45$.
The final balance is \$615.45.

ii. Interest compounds twice a year, so we need to halve the rate and double the number of time periods given in the question.
Hence $r = 4.5\% = 0.045$ and $n = 10$, so $F = 400 \times (1 + 0.045)^{10} = 400 \times 1.045^{10} \approx 621.19$.
The final balance is \$621.19.

iii. Interest compounds 4 times a year, so we need to divide the given rate by 4 and multiply the given number of years by 4.

Hence $r = 2.3\% = 0.0225$ and $n = 20$, so $F = 400 \times (1 + 0.0225)^{20} = 400 \times 1.0225^{20} \approx 624.20$.
The final balance is \$624.20.

iv. Interest compounds 12 times a year, so we need to divide the given rate by 12 and multiply the given number of years by 12.
Hence $r = 0.8\% = 0.0075$ and $n = 60$, so $F = 400 \times (1 + 0.0075)^{60} = 400 \times 1.0075^{60} \approx 626.27$.
The final balance is \$626.27.

v. Interest compounds continuously, so $F = 400e^{0.09\times 5} = 400e^{0.45} \approx 627.32$.
The final balance is \$627.32.

(**3**) Given an angle a in radians, to convert a to degrees you multiply by 180 and divide by π. Hence the converted angles are:

$$-720^\circ \quad 2880^\circ \quad -60^\circ \quad 0^\circ \quad -396^\circ \quad 0^\circ \quad 81^\circ \quad 96^\circ$$

(**4**) Given an angle a in degrees, to convert a to radians you divide by 180 and multiply by π. Hence the converted angles are:

$$\frac{11\pi}{5} \quad \frac{3\pi}{4} \quad \frac{8\pi}{9} \quad -\frac{8\pi}{9} \quad -\frac{4\pi}{3} \quad -10\pi \quad 4\pi \quad \frac{2\pi}{15}$$

(**5**) **i**. $\log_2 2^{18} = 18$

ii. $4 = 2^2$, so $\log_2 4 = 2$

iii. $\frac{1}{3} = 3^{-1}$, so $\log_3 \frac{1}{3} = \log_3 3^{-1} = -1$. Hence the answer is -1.

iv. $1000 = 10^3$, so $\log_{10} 1000 = 3$

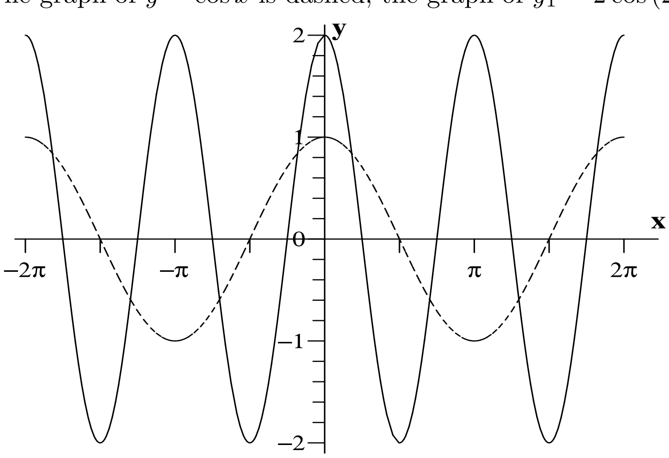
v. $\frac{1}{100000} = 10^{-5}$, so $\log_{10} \frac{1}{100000} = -5$

vi. $\ln e^{-6} = -6$

vii. $\frac{1}{e^{18}} = e^{-18}$, so $\ln \frac{1}{e^{18}} = \ln e^{-18} = -18$. Hence the answer is -18.

viii. $3 = 9^{\frac{1}{2}}$, so $\log_9 3 = \frac{1}{2}$

(**6**) The graph of $y = \cos x$ is dashed; the graph of $y_1 = 2\cos(2x)$ is solid.



4. (**1**) **i**. $-14y - x + 12 = -14y + 14$, so $-x = 2$, so $x = -2$. Hence this is a vertical line, with x negative. Hence the matching graph is Graph A.

ii. $-12y+8x+10=-14y+9x-12$, so $2y=x-22$. Hence this is a straight line, with positive gradient and negative y-intercept. Hence the matching graph is Graph E.

iii. $-13y=-14y-12x^2$, so $y=-12x^2$. This equation includes an x^2 term with a negative coefficient, so the graph is a parabola which turns downwards. Also, the y-intercept is 0. Hence the matching graph is Graph S.

iv. $-3y-2x=-2y-2x-4$, so $-y=-4$, so $y=4$. Hence this is a horizontal line, with y positive. Hence the matching graph is Graph C.

v. $-13x=-14x+5$, so $x=5$. Hence this is a vertical line, with x positive. Hence the matching graph is Graph B.

vi. $13y-1=-11x^2-7$, so $13y=-11x^2-6$. This equation includes an x^2 term with a negative coefficient, so the graph is a parabola which turns downwards. Also, the y-intercept is negative. Hence the matching graph is Graph T.

vii. $y=-5\times|-8x|$, so $y=-5\times|8x|$, which is a graph of negative absolute value. Hence the matching graph is Graph M.

viii. $6y-4x+15=10y-9x+8$, so $4y=5x+7$. Hence this is a straight line, with positive gradient and positive y-intercept. Hence the matching graph is Graph G.

(**2**) Let P be the amount invested, r be the interest rate per time period, n be the number of time periods and F be the final value. In each case, $P=400$. Then:

i. Interest compounds annually, so we use the rate and number of time periods given in the question.
Hence $r=9.0\%=0.09$ and $n=4$, so $F=400\times(1+0.09)^4=400\times1.09^4\approx564.63$.
The final balance is \$564.63.

ii. Interest compounds twice a year, so we need to halve the rate and double the number of time periods given in the question.
Hence $r=4.5\%=0.045$ and $n=8$, so $F=400\times(1+0.045)^8=400\times1.045^8\approx568.84$.
The final balance is \$568.84.

iii. Interest compounds 4 times a year, so we need to divide the given rate by 4 and multiply the given number of years by 4.
Hence $r=2.3\%=0.0225$ and $n=16$, so $F=400\times(1+0.0225)^{16}=400\times1.0225^{16}\approx571.05$.
The final balance is \$571.05.

iv. Interest compounds 12 times a year, so we need to divide the given rate by 12 and multiply the given number of years by 12.
Hence $r=0.8\%=0.0075$ and $n=48$, so $F=400\times(1+0.0075)^{48}=400\times1.0075^{48}\approx572.56$.
The final balance is \$572.56.

v. Interest compounds continuously, so $F=400e^{0.09\times4}=400e^{0.36}\approx573.33$.
The final balance is \$573.33.

(**3**) Given an angle a in radians, to convert a to degrees you multiply by 180 and divide by π. Hence the converted angles are:

$$0^\circ \quad 252^\circ \quad -2520^\circ \quad -120^\circ \quad 27^\circ \quad 27^\circ \quad -360^\circ \quad 216^\circ$$

(**4**) Given an angle a in degrees, to convert a to radians you divide by 180 and multiply by π. Hence the converted angles are:

$$\frac{13\pi}{10} \quad 23\pi \quad -\frac{3\pi}{2} \quad -\frac{11\pi}{9} \quad -\frac{13\pi}{5} \quad \frac{16\pi}{15} \quad -\frac{7\pi}{15} \quad -\frac{11\pi}{5}$$

(**5**) **i**. $\log_9 9^{15} = 15$

ii. $125 = 5^3$, so $\log_5 125 = 3$

iii. $\dfrac{1}{125} = 5^{-3}$, so $\log_5 \dfrac{1}{125} = \log_5 5^{-3} = -3$. Hence the answer is -3.

iv. $1000 = 10^3$, so $\log_{10} 1000 = 3$

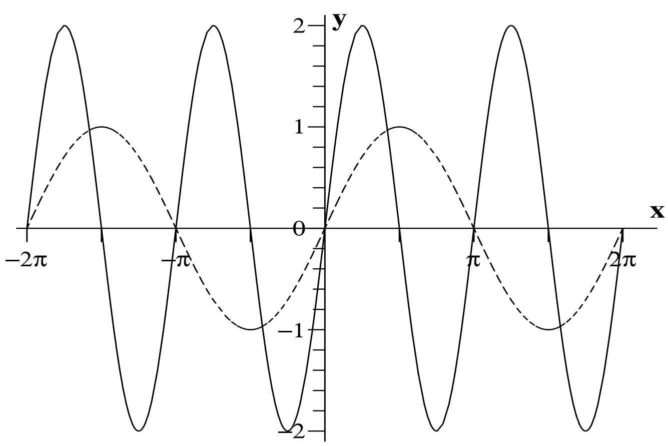
v. $\dfrac{1}{100000} = 10^{-5}$, so $\log_{10} \dfrac{1}{100000} = -5$

vi. $e = e^1$, so $\ln e = 1$

vii. $\dfrac{1}{e} = e^{-1}$, so $\ln \dfrac{1}{e} = \ln e^{-1} = -1$. Hence the answer is -1.

viii. $3 = 27^{\frac{1}{3}}$, so $\log_{27} 3 = \dfrac{1}{3}$

(**6**) The graph of $y = \sin x$ is dashed; the graph of $y_1 = 2\sin(2x)$ is solid.



5. (**1**) **i**. $2y + x + 13 = 4y - x + 13$, so $2y = 2x$. Hence this is a straight line, with positive gradient and passing through the origin. Hence the matching graph is Graph F.

ii. $2y - 5 = -9y + 2x^2 - 12$, so $11y = 2x^2 - 7$. This equation includes an x^2 term with a positive coefficient, so the graph is a parabola which turns upwards. Also, the y-intercept is negative. Hence the matching graph is Graph Q.

iii. $y = 10 \times |8x|$, which is a graph of absolute value. Hence the matching graph is Graph N.

iv. $-6y - 9x = -11y - 10x$, so $5y = -x$. Hence this is a straight line, with negative gradient and passing through the origin. Hence the matching graph is Graph I.

v. $y = e^{5x}$, which is a graph of exponential growth. Hence the matching graph is Graph K.

vi. $-10y - x - 10 = -13y - 16$, so $3y = x - 6$. Hence this is a straight line, with positive gradient and negative y-intercept. Hence the matching graph is Graph E.

vii. $15y + 7x^2 = 16y + 10x^2$, so $y = -3x^2$. This equation includes an x^2 term with a negative coefficient, so the graph is a parabola which turns downwards. Also, the y-intercept is 0. Hence the matching graph is

Graph S.

viii. $y = e^{-6x}$, which is a graph of exponential decay. Hence the matching graph is Graph L.

(**2**) Let P be the amount invested, r be the interest rate per time period, n be the number of time periods and F be the final value. In each case, $P = 200$. Then:

i. Interest compounds annually, so we use the rate and number of time periods given in the question. Hence $r = 9.0\% = 0.09$ and $n = 1$, so $F = 200 \times (1 + 0.09)^1 = 200 \times 1.09^1 \approx 218.00$. The final balance is \$218.00.

ii. Interest compounds twice a year, so we need to halve the rate and double the number of time periods given in the question. Hence $r = 4.5\% = 0.045$ and $n = 2$, so $F = 200 \times (1 + 0.045)^2 = 200 \times 1.045^2 \approx 218.40$. The final balance is \$218.40.

iii. Interest compounds 4 times a year, so we need to divide the given rate by 4 and multiply the given number of years by 4. Hence $r = 2.3\% = 0.0225$ and $n = 4$, so $F = 200 \times (1 + 0.0225)^4 = 200 \times 1.0225^4 \approx 218.62$. The final balance is \$218.62.

iv. Interest compounds 12 times a year, so we need to divide the given rate by 12 and multiply the given number of years by 12. Hence $r = 0.8\% = 0.0075$ and $n = 12$, so $F = 200 \times (1 + 0.0075)^{12} = 200 \times 1.0075^{12} \approx 218.76$. The final balance is \$218.76.

v. Interest compounds continuously, so $F = 200e^{0.09\times 1} = 200e^{0.09} \approx 218.83$. The final balance is \$218.83.

(**3**) Given an angle a in radians, to convert a to degrees you multiply by 180 and divide by π. Hence the converted angles are:

$$-180^\circ \quad -81^\circ \quad -450^\circ \quad 480^\circ \quad -216^\circ \quad -140^\circ \quad 300^\circ \quad -90^\circ$$

(**4**) Given an angle a in degrees, to convert a to radians you divide by 180 and multiply by π. Hence the converted angles are:

$$-\frac{\pi}{2} \quad -22\pi \quad -\frac{\pi}{2} \quad -\frac{\pi}{10} \quad 6\pi \quad -19\pi \quad -\frac{\pi}{2} \quad -\frac{13\pi}{9}$$

(**5**) **i**. $\log_{11} 11^{19} = 19$

ii. $64 = 4^3$, so $\log_4 64 = 3$

iii. $\frac{1}{25} = 5^{-2}$, so $\log_5 \frac{1}{25} = \log_5 5^{-2} = -2$. Hence the answer is -2.

iv. $100 = 10^2$, so $\log_{10} 100 = 2$

v. $\frac{1}{100000} = 10^{-5}$, so $\log_{10} \frac{1}{100000} = -5$

vi. $\ln e^3 = 3$

vii. $\frac{1}{e^{12}} = e^{-12}$, so $\ln \frac{1}{e^{12}} = \ln e^{-12} = -12$. Hence the answer is -12.

viii. $2 = 8^{\frac{1}{3}}$, so $\log_8 2 = \frac{1}{3}$

(**6**) The graph of $y = \sin x$ is dashed; the graph of $y_1 = \dfrac{1}{2}\sin x$ is solid.