34.

$$\log_x 2 = 5$$

$$x^5 = 2$$

$$\left(x^5\right)^{\frac{1}{5}} = (2)^{\frac{1}{5}}$$

D

$$x = \sqrt[5]{2}$$

$$x \approx 1.1487$$

35.

$$\frac{\log_5\left(\frac{1}{8}\right)}{\log_5(2)} = \log_2\left(\tfrac{1}{8}\right) = \log_2\left(2^{-3}\right) = -3$$

36.

$$3^{x-5} = 4$$

$$\log 3^{x-5} = \log 4$$

$$(x-5)\log 3 = \log 4$$

C

$$x - 5 = \frac{\log 4}{\log 3}$$

$$x = \frac{\log 4}{\log 3} + 5$$

37.

$$\log_3 \sqrt{2x+3} = 2$$

$$3^2 = \sqrt{2x+3}$$

$$\sqrt{2x+3} = 9$$

C

$$\left(\sqrt{2x+3}\right)^2 = (9)^2 \qquad \text{Check}: \sqrt{2(39)+3} = 9$$

$$2x + 3 = 81 \qquad 9 = 9$$

$$2x = 78 \qquad \text{Check}: \log_3 \sqrt{2(39)+3} = 2$$

$$x = 39 \qquad 3^2 = \sqrt{81}$$

38.

$$\log_3 m = 8 \qquad \log_3\left(\frac{\sqrt{mn}}{p^3}\right) = \log_3(mn)^{\frac{1}{2}} - \log_3 p^3$$

$$\log_3 n = 10 \quad \Rightarrow \quad = \log_3\left(m^{\frac{1}{2}} n^{\frac{1}{2}}\right) - \log_3 p^3$$

A

$$\log_3 p = 6 \qquad = \log_3 m^{\frac{1}{2}} + \log_3 n^{\frac{1}{2}} - \log_3 p^3$$

$$= \frac{1}{2}\log_3 m + \frac{1}{2}\log_3 n - 3\log_3 p$$

$$= \frac{1}{2}(8) + \frac{1}{2}(10) - 3(6)$$

$$= 4 + 5 - 18 = -9$$

39. Half-life means when half of te initial amount still remains, $\frac{1}{2}q_o$.

$$\tfrac{1}{2}q_o = q_o e^{-0.0063t}$$

$$\tfrac{1}{2} = e^{-0.0063t}$$

$$\ln\left(\tfrac{1}{2}\right) = \ln\left(e^{-0.0063t}\right)$$

$$\ln\left(\tfrac{1}{2}\right) = -0.0063t$$

$$\frac{\ln(0.5)}{-0.0063} = t \approx 110.0 \text{ days}$$

40.

$$y = 2 + 2^x$$

When $x = 0$, $y = 2 + 2^0$

D

$$y = 2 + 1 = 3$$

41.

$$\begin{cases} x + 4y = 3 \;\Rightarrow\; x = 3 - 4y \\ 2x - 6y = 8 \end{cases}$$

$$2(3 - 4y) - 6y = 8$$

$$6 - 8y - 6y = 8$$

$$y = \tfrac{2}{-14} = -\tfrac{1}{7} \Rightarrow x = 3 - 4\left(-\tfrac{1}{7}\right) = \tfrac{25}{7}$$

$$\left(\tfrac{25}{7}, -\tfrac{1}{7}\right)$$

42.

$$\begin{cases} x^2 + y^2 = 16 \\ 2y - x = 4 \Rightarrow x = 2y - 4 \end{cases}$$

$(2y-4)^2 + y^2 = 16$

$4y^2 - 16y + 16 + y^2 = 16$

$5y^2 - 16y = 0$

$y(5y-16) = 0$

$y = 0 \Rightarrow x = 2(0) - 4 = -4$

$y = \frac{16}{5} \Rightarrow x = 2\left(\frac{16}{5}\right) - 4 = \frac{12}{5}$

$(-4,0)$ & $\left(\frac{12}{5}, \frac{16}{5}\right)$

43.

$$\begin{cases} x + y - z = -1 \quad \Rightarrow x = -y + z - 1 \\ 4x - 3y + 2z = 16 \\ 2x - 2y - 3z = 5 \end{cases}$$

$$\begin{cases} 4(-y + z - 1) - 3y + 2z = 16 \\ 2(-y + z - 1) - 2y - 3z = 5 \end{cases}$$

$$\begin{cases} -7y + 6z - 4 = 16 \\ -4y - z - 2 = 5 \end{cases}$$

$$\begin{cases} -7y + 6z = 20 \\ -4y - z = 7 \quad \Rightarrow z = -4y - 7 \end{cases}$$

$-7y + 6(-4y - 7) = 20$

$-31y = 62$

$y = -2$

$y = -2 \Rightarrow z = -4(-2) - 7$

$z = 1$

44.

$$\begin{array}{r} x^2 + 6x + 34 \\ x^2 - 6x + 0 \overline{\big)\, x^4 + 0x^3 - 2x^2 + 0x - 3} \\ +\left({}^-x^4 + 6x^3 + {}^-0x^2\right) \\ \hline 6x^3 - 2x^2 + 0x \\ +\left({}^-6x^3 + 36x^2 + {}^-0x\right) \\ \hline 34x^2 + 0x - 3 \\ +\left({}^-34x^2 + 204x + {}^-0\right) \\ \hline 204x - 3 \end{array}$$

C

$q(x) = x^2 + 6x + 34$

$r(x) = 204x - 3$

45. If the denominator of the function is equal to zero the function will be undefined.

$$f(x) = \frac{(x+3)(x-3)}{x(x+2)}$$

when $x = 0$ or $x = -2$

46.

$$y = x^2(x-1)(x+1)^2$$

x - intercepts: $x^2(x-1)(x+1)^2 = 0$

$x = 0,\ x = 1,\ x = -1$

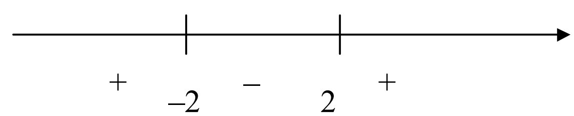
A

Interval	$(-\infty,-1)$	$(-1,0)$	$(0,1)$	$(1,\infty)$
x^2	+	+	+	+
$x-1$	−	−	−	+
$(x+1)^2$	+	+	+	+
Result	− below x - axis	− below x - axis	− below x - axis	+ above x - axis

47.

$x = 2 \Rightarrow$ x - intercept

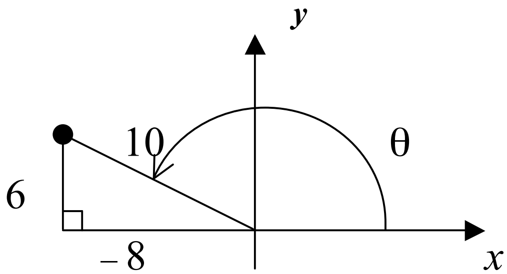
$x = -2 \Rightarrow$ vertical asymptote



E is the closest answer. The scale is a bit off on the x-axis.

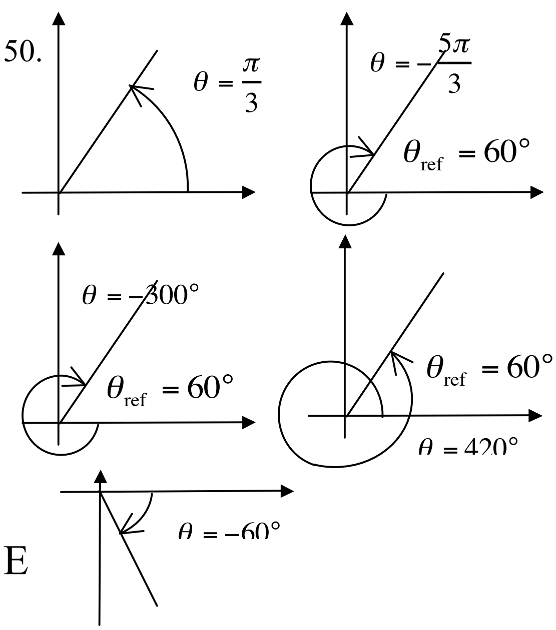
48. Shifted left 1 unit, then reflected about x-axis, then shifted down 2 units -- Answer: C

49.



$$\sin\theta = \frac{6}{10} = \frac{y}{r}$$
$$x^2 + y^2 = r^2$$
$$x^2 + 6^2 = 10^2$$
$$x^2 = 64$$
$$x = \pm 8$$
$$x = -8$$
$$\cos\theta = \frac{x}{r} = \frac{-8}{10} = -0.8$$

50.



E

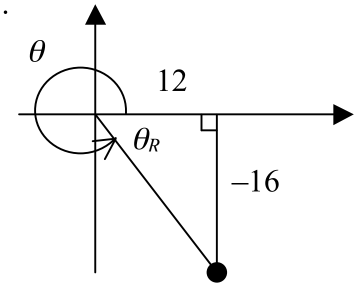
51.

$$135° \cdot \frac{\pi \text{ radians}}{180°} = \frac{3\pi}{4}$$

52.

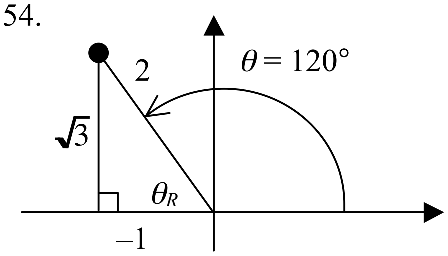
$$\sec 126° = \frac{1}{\cos 126°} \approx \frac{1}{-0.587785} \approx -1.7013$$

53.



$$\tan\theta = \frac{y}{x} = \frac{-16}{12} = -\frac{4}{3}$$

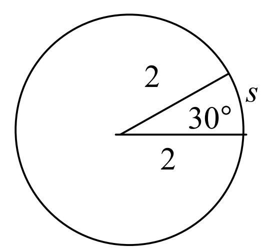
54.



$\theta_R = 60°$

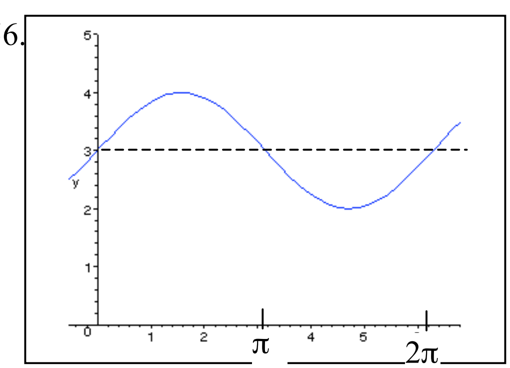
$$\tan\theta = \frac{y}{x} = \frac{\sqrt{3}}{-1} = -\sqrt{3}$$

55.



$$s = r\theta = 2\left(\frac{\pi}{6}\right) = \frac{\pi}{3} \approx 1.047$$

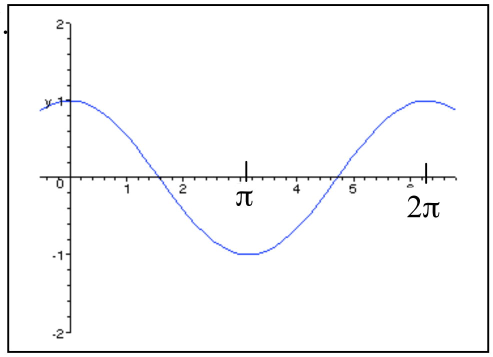
56.



The graph is the $y = \sin x$ shifted up three units.

I(yes), II(no), III(yes), IV(yes), **B**

57.



D = all real number = $(-\infty,\infty)$
R = all possible outputs/y-values = $[-1,1]$

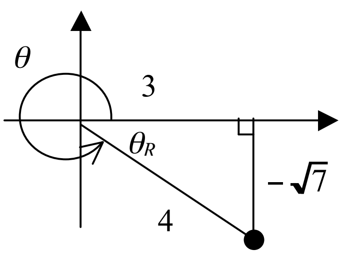
58.

59.

$$\frac{\tan x\cdot\cos x\cdot\csc x}{\cot x\cdot\sec x\cdot\sin x}=\frac{\tan x\cdot\tan x\cdot\cos x\cdot\cos x}{\sin x\cdot\sin x}$$

$$=\frac{\tan^2 x\cdot\cos^2 x}{\sin^2 x}=\frac{\sin^2 x}{\cos^2 x}\cdot\frac{\cos^2 x}{\sin^2 x}=1$$

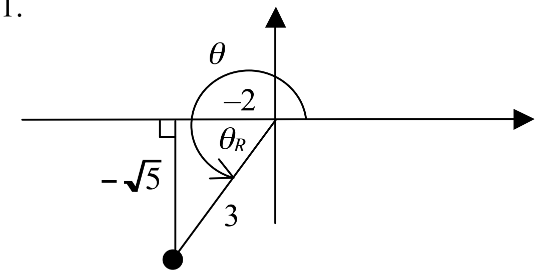
60.



$$x^2+y^2=r^2$$
$$y^2=4^2-3^2$$
$$y=\pm\sqrt{7}$$
$$y=-\sqrt{7}$$

$$\sin 2\theta=2\sin\theta\cos\theta$$
$$=2\left(\frac{-\sqrt{7}}{4}\right)\left(\frac{3}{4}\right)=-\frac{3\sqrt{7}}{8}$$

61.



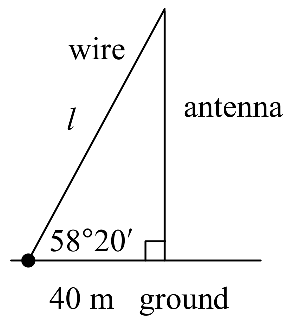
Given : $\tan\theta=\frac{\sqrt{5}}{2}=\frac{-\sqrt{5}}{-2}=\frac{y}{x}\Uparrow$

$\underbrace{\frac{\theta}{2}\text{ is in QII}}$, $\cos\left(\frac{\theta}{2}\right)=\pm\sqrt{\frac{1+\cos\theta}{2}}$

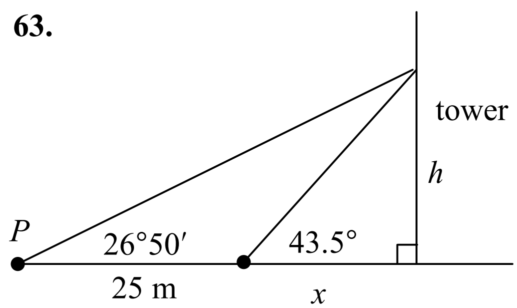
$$\cos\left(\frac{\theta}{2}\right)=-\sqrt{\frac{1+\left(\frac{-2}{3}\right)}{2}}=-\sqrt{\frac{1-\frac{2}{3}}{2}}$$

62.

$$\cos 58.\overline{3}^\circ=\frac{40}{l}$$
$$l\cdot\cos 58.\overline{3}^\circ=40$$
$$l=\frac{40}{\cos 58.\overline{3}^\circ}$$
$$l\approx 76.2\text{ m}$$



63.



$$\tan 43.5^\circ=\frac{h}{x},\quad \tan 26.8\overline{3}^\circ=\frac{h}{x+25}$$
$$h=x\cdot\tan 43.5^\circ$$
$$\tan 26.8\overline{3}^\circ=\frac{x\cdot\tan 43.5^\circ}{x+25}$$
$$\tan 26.8\overline{3}^\circ(x+25)=x\cdot\tan 43.5^\circ$$
$$x\tan 26.8\overline{3}^\circ+25\tan 26.8\overline{3}^\circ=x\cdot\tan 43.5^\circ$$
$$25\tan 26.8\overline{3}^\circ=x\cdot\tan 43.5^\circ-x\tan 26.8\overline{3}^\circ$$
$$x=\frac{25\tan 26.8\overline{3}^\circ}{\tan 43.5^\circ-\tan 26.8\overline{3}^\circ}\approx 28.541487$$
$$h=x\cdot\tan 43.5^\circ\approx 27.1\text{ meters}$$

64. Examine r when $\theta = 0$ and as $\theta \to 90°$

A. $r = 1$ when $\theta = 0$ and as $\theta \to 90°$ $r \to 2$, looks right as the angle changes from 0° to 90°.

B. $r = 2$ when $\theta = 0$ and as $\theta \to 90°$ $r \to 1$, looks incorrect as the angle changes from 0° to 90°. The radial distance should be getting bigger.

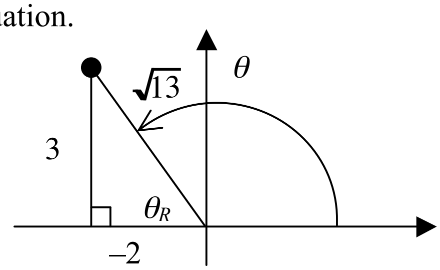
C. $r = 1$ when $\theta = 0$ and as $\theta \to 90°$ $r \to 0$, looks incorrect as the angle changes from 0° to 90°. The radial distance should be getting bigger.

D. $r = 2$ when $\theta = 0$ and as $\theta \to 90°$ $r \to 0$, looks incorrect as the angle changes from 0° to 90°. The radial distance should be getting bigger.

E. $r = 0$ when $\theta = 0$ and as $\theta \to 90°$ $r \to 2$, looks incorrect as the angle changes from 0° to 90°. When the angle is zero the radial distance should greater than zero.

Plugging in further angles would yield more points that will confirm that **A** is the correct polar equation.

65.



$r^2 = \left(-2^2\right) + 3^2$

$r = \sqrt{13}$

$\tan\theta = \dfrac{y}{x} = \dfrac{3}{-2} \Rightarrow \tan^{-1}\left(-\dfrac{3}{2}\right) \approx -56.301°$

$\theta_R = +56.301°$

$\theta = 180° - \theta_R \approx 123.7°$

$\left(\sqrt{13}, 123.7°\right)$

66.

$x^2 - 2x + y^2 = 0$

$x^2 + y^2 - 2x = 0$

$r^2 - 2r\cos\theta = 0$

$r(r - 2\cos\theta) = 0$

$r = 0$, which is not an equation of the given circle

<u>or</u> <u>$r = 2\cos\theta$</u>